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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. FEBRUARY 9, 1899. CHICAGO, ILL. NUMBER 6

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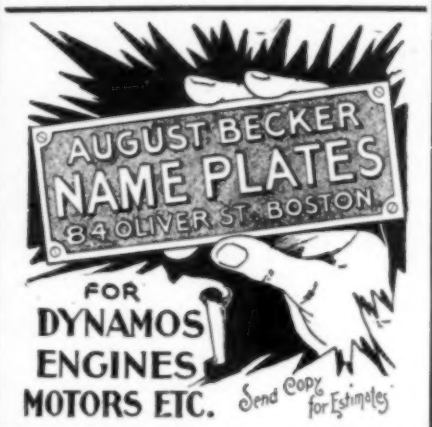

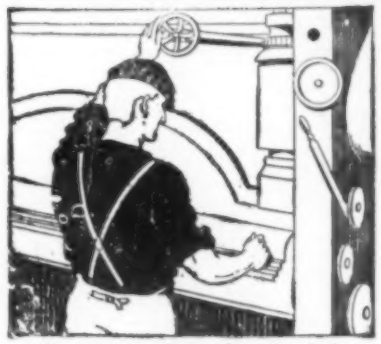

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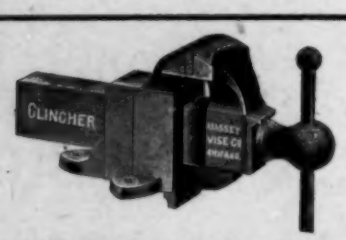

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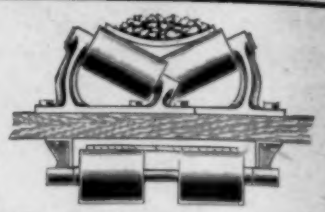

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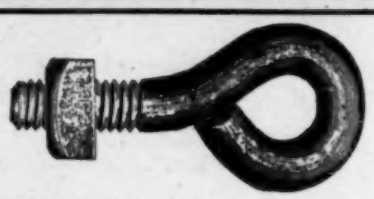

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. FEBRUARY 9, 1899. CHICAGO, ILL. NUMBER 6

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade has moved farther up, in the past week, and is coming close to the line that in the minds of many of the leaders may not be crossed with safety. There is not the same conservatism in all quarters that has been shown in advancing ore and coke, or even Bessemer pig iron; and this fact, together with the control of intermediate products, already exercised in some cases and aimed at by pending negotiations in others, presents some possibilities of complications later. The advances of the week are in Bessemer and foundry irons, steel billets, rails, sheets, plates, bars and wire and wire nails. None of them have had any effect to stop business where producers were at all able to promise the deliveries wanted. There is no sign of slackening in demand; in fact, while production increases, it is still outrun by consumption. The disparity between output and demand promises to be greater as the year advances, in the case of foundry and mill irons, than in Bessemer iron. The list of furnaces producing foundry iron will be increased by various preparations now being made, but as we have pointed out heretofore, non-Bessemer ores, particularly the Lake Superior supply, are so well taken up that even furnaces fairly equipped and able to make a small profit on to-day's prices can not by that token be counted as possible reserves. Southern irons have advanced again, going to $12.75 for No. 2 at Chicago; and Northern irons, particularly from the Central district, being still at a lower price, have gone farther afield than usual, in response to the demand diverted to them. With the moderate advance on ores and coke, the merchant furnaces west of the Alleghenies are in position to compensate in part for their unprofitable experiences of the past few years. The consolidation of Bessemer and open-hearth steel plants in the Central West is approaching completion. The National Steel Co. is the corporate name, and there will be $50,000,000 each of preferred and common stock. The underwriting has been well over-subscribed. The plants to be included, either by outright purchase or by securing a majority of stock, are those at New Castle and Sharon, Pa.; Youngstown, Columbus, Martin's Ferry and Bellaire, O.; Wheeling, W. Va., and Muncie, Ind. Some fanciful newspaper projects, involving important existing companies, have been built up about this plan of the interests which promoted the American Tin Plate Co. The week has also brought forth rumor and publication concerning a putative transfer of the Rockafeller vessel and Mesabi railroad properties to the Carnegie Steel Co. Doubtless such a transfer has been discussed in the same way that the building of a new short-line road from the Carnegie mines on the Gogebic range to a Lake Superior port was mooted when these properties were acquired; but the purchase of vessels and railroad has not been made and there is to-day no competent authority for the statement that it will be made. The advances in finished material the past week came as legitimate advances always come, from persistent demand, on top of order books filled for months ahead. In rails the new price is $22 on standard sections for large lots, while advances of $1 and $2 are asked on less than 100 tons and less than carloads, respectively. Light rails are now $25 in large lots. On standard sections the advance is $3 from recent prices on large contracts and $5 above the early basis for 1899 contracts. Sheets, both black and galvanized, are about $2 a ton higher; bars, $1 a ton, with mills filled up in an unprecedented way. Pipes and tubes are likely to move up as the result of a meeting next week. Wire and wire nails are $2 a ton higher than at last report. Plate demand continues out of all proportion to the ability of the country's present capacity, and prices are determined by the urgency of each individual want. Bridge and shipyard work continues on a prodigious scale and the year will doubtless make a record in both. Some 7,500 tons of material is wanted for three lake vessels for launching in 1900. Structural mills are probably in better shape to make deliveries than those in any other line; but angles show signs of the congestion that precedes in advance. The cast iron pipe consolidation is practically completed, as is that of leading car works. The bridge combine is much less likely to be made.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Feb. 8.

The iron and steel market has experienced an activity in the past week which, in view of the scarcity of material, has resulted in still greater tightness and in advances in several lines. The pressure on steel mills for deliveries on old contracts and for the placing of new ones has been very severe, and nothing below $18, maker's mill, Pittsburg. Wheeling or valley, can now be done. Bessemer pig has been marked up and there is scarcely a line of finished material in which prices are not higher, or at least stronger, this week than last. Steel bars have advanced a dollar a ton and are now firm at 1.15c, Pittsburg. There is little material for export at the present time, irrespective of whether present prices would permit of capturing orders.

PIG IRON.—Valley pig iron was advanced late last week 50 cents a ton and is now quoted at $11, valley furnace. No quotations are made for delivery beyond July 1, and up to that date the furnaces are not willing to contract for any large lots, as they are already comfortably filled. Bessemer pig at Pittsburg has advanced, in line with this move, and is now firm at about $11.50. Foundry iron prices are somewhat stiffer in the face of a fair demand. Gray forge iron has strengthened in the valley, though not to the same extent as Bessemer. As high as $10.25, valley, has been done, while in Pittsburg there have been some sales above $10, the minimum. We quote:

Bessemer, valley furnace	$11.00
Bessemer, Pittsburg	11.50 to 11.65
No. 1 Foundry	11.10 to 11.30
No. 2 Foundry	10.65 to 10.75
No. 3 Foundry	10.00 to 10.10
Gray Forge, valley furnace	10.00 to 10.25
Gray Forge, Pittsburg	10.00 to 10.15

STEEL.—There is a constant pressure on steel mills for deliveries of material on contracts, and notwithstanding that the mills are working up to their full limit there is considerable complaint on the part of consumers. Inquiry is moderate, but it is too heavy for the sold up condition of the mills, and an order for a round lot for delivery this side of the middle of the year could not be placed at all; while for deliveries in the second half the mills are unwilling to quote. Here and there a lot of steel can be sandwiched in, but no price below $18, mill, can be made, and this figure is quoted for Pittsburg, Wheeling, or Valley producer. Open-hearth steel is very scarce and the current market quotation is $22 a ton. A sale is reported at $24 a ton to a consumer who was very anxious to secure a certain delivery. It is reported that one or two odd lots of sheet bars have changed hands during the past week but no details whatever can be learned, and there is really no market in sheet bars or in wire rods.

SHEETS.—The sheet market has made up in the last two weeks for its former lagging behind the general advance in iron and steel lines. As high as 2.10c is now named for No. 28 common and it is doubtful if any could be secured at 2.05c, which is now the usual quotation for No. 27. These prices are named equally for nearby delivery or for deliveries running up to July 1, beyond which the mills will not quote at all. The mills are well filled with orders and prompt shipments are difficult to secure. Galvanized is also stronger and the quotation last week of 80 per cent can no longer be secured, 75, 10 and 5 per cent with the usual freight allowance being the best quotation, while some mills have quoted as high as 75 and 10. It is reported that the negotiations looking to a consolidation of the sheet mills are progressing satisfactorily, and there is little doubt in the trade that a successful consummation will be reached, although details of the work of organization are wholly lacking. The manufacturers will hold a regular monthly meeting next Tuesday and the matter may be discussed at that time. The advance in sheets in the past two months represents about the increased cost due to the advance in steel.

RAILS AND TRACK MATERIAL.—The rail manufacturers have advanced prices in the past week, the market for some time having been very strong under the heavy sales of standard sections. Light sections, also, have been quite active. The price is now $22 for standard sections in large lots; $23 for carload lots and over, up to 100 tons; $24 for less than carload lots. For light rails the quotation is now $25 in large lots and $28 for less than car lots. Considering the advance in other lines, the change in price is in consonance with the conditions. In track material there is a heavy demand and prices are very firm at the following rates: Spikes, 1.45c; track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins are quoted from 1.30c to 1.35c.

PLATES.—The demand for plates is the greatest ever seen in this district and all the mills are pushed to their utmost capacity. One concern stated that the orders now on hand would keep three such mills busy. Steel car construction has enormously increased the call for plates, and the foreign trade is also making quite a drain on Pittsburg mills. Under such circumstances higher prices are unavoidable, and quotations which at last report were very firm have advanced. This week tank plate is quoted at 1.45c to 1.50c; shell, 1.55c; flange, 1.60c; fire box, 2c and upward.

SPELTER.—The past week has developed a much stronger situation. Prices have advanced on the statement that the London market this week is the highest in 15 years. The local quotation is now 5.90c; New York, 6c, and St. Louis, 5.75c. The present figure for high grade zinc ore at Joplin, Mo., is $34 per ton in the bin, with $1.50 more for fancy ores.

PIPES AND TUBES.—Orders are crowding into the local pipe mills so fast that contracts which would have been eagerly taken during the regular season are now being declined. As an illustration, one establishment reports an order for 30 miles of large sized pipe refused on account of inability to secure the raw material. Quotations remain unchanged, but a meeting is to be held next week at which it is expected the list will be advanced. Pipe manufacturers say this is absolutely necessary on account of the increasing cost of skelp. We quote: Additional discounts:—Five tens and seven and a half for less than carloads with an extra five for carloads; base discounts:—Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off; butt weld, galvanized, 45 per cent off; lap weld, galvanized, 50 per cent off. Discounts on merchant boiler tubes are as follows: 1¼-inch to 2½-inch inclusive, 70 per cent off; 2¾-inch and larger, 72½ per cent off, with an extra 5 per cent to dealers. Inserted joint casing is quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off, with an extra 2½ per cent to dealers.

IRON AND STEEL SKELP.—The great activity among the pipe mills has made a more urgent demand for skelp. All skelp makers are very busy, having more than they can possibly do in the time specified by purchasers. Prices remain as they were but an early advance is more than probable. Grooved iron skelp, 1.10c to 1.15c; sheared iron skelp, 1.25c to 1.27½c; grooved steel skelp, 1.05c to 1.7½c; sheared steel skelp, 1.20c to 1.25c.

OLD MATERIAL.—Scrap iron and steel is moving more freely than for some time past, although prices show no change. These, however, are held more firmly, as the call for scrap material is growing larger. Melting stock, $11.25 to $11.50; old steel rails, long lengths, $10.25 to $10.50; cut, $10.50 to $10.75; old iron rails, $14.50; wrought iron scrap, $11.50, net valley; cast borings, $6, net, valley; busheling scrap, $9, net; car wheels, $10.25, gross; cast scrap, $9, gross; iron axles, $6, net; steel axles, $12.50, gross; charcoal scrap, $10, gross; wrought turnings, $6.75, net, valley.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, Feb. 8.

Advances were the rule last week, prices on nearly all grades of material having been raised materially. Mills and furnaces are taking business sparingly, as in most cases they are well filled with orders for the next three to six months, and can take contracts only for delivery beyond that time. The demand for steel is large and good sales could have been made if the mills were in position to accept the orders.

PIG IRON.—Another advance has been made in the price of Southern iron of 75 cents a ton to a basis of $12.75, Chicago, for No. 2 foundry. Sales last week were not large and the local furnaces secured most of the business. Southern furnaces are sold so far ahead as to be unable to take orders of any large size for delivery within the next three or four months. Local furnaces are nearly as well sold, and are taking only small business and always at the full prices quoted. Buyers are not in the market very heavily at present and it is thought buying will be light for the next few weeks, giving the furnaces an opportunity to get caught up on their old business to some extent. Quotations on foundry irons are now made as follows:

Lake Sup. Charcoal	$12 50 @ $13 50	Southern Coke No. 3	$12 50 @ 12 75
Local Coke Fdy. No. 1	12 50 @ 13 00	Southern No. 1 Soft	13 00 @ 13 25
Local Coke Fdy. No. 2	12 00 @ 12 50	Southern No. 2 Soft	12 75 @ 13 00
Local Coke Fdy. No. 3	11 50 @ 12 00	Southern Silveries	12 50 @ 13 00
Local Scotch Fdy. No. 1	12 50 @ 13 00	Jackson Co. Silveries	13 00 @ 13 50
Local Scotch Fdy. No. 2	12 00 @ 12 50	Ohio Strong Softeners	12 50 @ 13 00
Local Scotch Fdy. No. 3	11 50 @ 12 00	Alabama Car Wheel	15 50 @ 16 50
Southern Coke No. 1	13 00 @ 13 25	Malleable Bessemer	11 50 @ 12 00
Southern Coke No. 2	12 75 @ 13 00	Coke Bessemer	11 50 @ 12 00

BARS.—Considerable business was placed last week in both large and small lots. The demand is increasing, inquiries having been received from farm implement manufacturers who are expected to place their business within the next few weeks. The buying from this class of consumers is expected to be heavier this year than ever before. The market is much stronger than it was a week ago and prices have advanced accordingly. Common iron is now selling at 1.20c to 1.25c and only on the most favorable business can this price be bettered. Guaranteed iron is quoted at 1.25c to 1.30c and soft steel bars 1.20c to 1.25c.

RAILS AND TRACK SUPPLIES.—Sales of light rails were good last week but only a few small orders for standard sections were taken. The demand for small lots of both light and standard sections is good. Quotations are as follows: Standard section rails, $20 to $22; light rails, $20 and upwards; steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

Later.—An advance has been made to $22 for standard sections, in large lots; while rails 30 pounds and under are $25 in large lots and $28 in less than car lots.

CAR ORDERS.—Two or three small orders for cars were

placed in this market last week but no large contracts were let. The demand for car material of all kinds is good and considerable sales were made last week.

BILLETS AND RODS.—The only sales made last week by the local mills were small orders of axle billets, which are quoted at $23. No further orders can be taken for delivery earlier than June. Open hearth billets are quoted at $21.50; Bessemer billets, $19.50; rods, $26.

STRUCTURAL MATERIAL.—The demand for material of all kinds is large, and were the mills in position to accept all the business offered the tonnage would be considerable. As it is sales are limited by the inability of the mills to take care of all business. There are a number of large building projects on the carpet and it is thought most of them will come to some conclusion within the next few weeks. The market is very firm and on some shapes is higher. Quotations are as follows: Beams, 15 inch and under, 1.45c to 1.50c; 18 inch and over, 1.55c to 1.60c; angles 1.35c to 1.40c; sheared plates 1.45c to 1.50c; universal plates 1.55c to 1.60c; tees 1.50c to 1.60c; zees 1.45c to 1.50c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—One large seller reports that two tons of plates are wanted for every ton the mills can make. The demand is largely in excess of the consumption and buyers are having trouble in getting their orders filled to their satisfaction. The market is very firm and prices are higher. Sales of about 3,000 tons were made last week by the local mills and a considerable tonnage was taken by mills farther east. Prices are as follows: Tank plates, 1.45c to 1.55c; flange steel, 1.50c to 1.60c; marine, 1.70c to 1 80c; fire box steel, 2.25c to 5c.

SHEETS—Black and galvanized sheets are both in good demand and orders last week called for a large tonnage. Among the business placed were two or three contracts of considerable size. Quotations are made at 2c to 2.10c for No. 27 black sheets, and 70, 10 and 5 per cent off for galvanized.

MERCHANT STEEL.—Mills are still unable to accept all the business offered, but the tonnage last week reached very fair proportions. Quotations follow: Open-hearth spring tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Sales are much better than for several weeks past and the demand indicates a continuance of the business. The heavier grades of scrap are in particularly good demand and several round lots were disposed of. Dealers' selling prices are as follows:

Old iron rails, gross,	$13 00@$13 50	Axles, net	$14 50@$15 00
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 25@ 4 50
Old steel rails, short	8 50@ 9 00	Wrought turnings, net	6 00@ 6 50
Old wheels, gross	11 75@ 12 25	Axle turnings, net	7 00@ 7 25
Railroad forge, net	11 75@ 12 25	Mixed steel, gross	6 50@ 7 00
Dealer's forge, net	9 50@ 10 00	Stove plates, net	5 75@ 6 00
No. 1 mill, net	7 25@ 8 00	Heavy melting steel, gr.	8 25@ 8 50
Heavy cast, net	8 50@ 9 00	Old iron splice b., net.	12 75@13 00
Malleable cast, net	8 00@ 8 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Feb. 8.

Ore sales for 1899 are already a matter of history for the most part. In the whirlwind of a week some millions of direct sales were made and other millions were set down in the usual way for furnaces having related mining interests, or owning and operating their own mines—these together making up the bulk of the 14,000,000 to 15,000,000 tons that the Lake Superior region will attempt to produce in 1899. There have been some ore buyers in the market for the past week and all have been taken care of, so far as can be learned. Whether any portions of the earliest purchases made will be available later in the year in re-sales by furnacemen who overestimated their wants, is a factor not determinable at this distance, but there have been such sequels of an early ore flurry, in which every furnaceman took pains to get ore in plenty. Eastern furnacemen, remote from the scene of activity, scarcely appreciated the situation, and when long-distance telephones brought them into it, they were not long in making their requisitions. Yet the failure of some to get the ores they have had in other years may lessen somewhat the amount of Lake Superior material shipped East this year. The non-Bessemer producers are probably more closely sold up than the Bessemer mines. The Marquette range hematites, which are always a considerable factor, were promptly taken at the advance upon 1898 prices previously noted. It is announced that the mines at Ishpeming and Negaunee will increase wages March 1, bringing back the level that prevailed when ore sold at 75 per cent above to-day's prices. It is settled that the lease of the Queen mine at Negaunee, whose ores are excellently adapted to the production of basic iron, passes to the Carnegie Steel Co.

PIG IRON.—With no important transactions, prices of pig iron continue strong, with advanced quotations. Southern grades are so high, under the two recent advances, that valley irons have gone farther out of their territory than usual. Quotations made by most sellers are $10.50 for No. 2 and $11 for No. 1 at valley furnace. Gray forge is nominally $10 to $10.25 valley and no sales reported. The situation in foundry iron is illustrated by the sale of 1,000 tons of off Bessemer for foundry use, at $10.60 at furnace, or 10 cents above the Bessemer price of last week. The $10.50 quotation on Bessemer has been withdrawn, and though no iron has been sold at $11, that is the basis on which the next business will be done. Lake Superior charcoal, under heavy sales in the past 30 days, is now held at $12.50, Cleveland, as a minimum, and quotations are from that figure up to $13.50, according to grade. Makers are well sold ahead, the largest producers having very little to offer for the next six months. We quote f. o. b. Cleveland:

Bessemer	$11 65	Valley Scotch No. 1	$11 65
No. 1 Strong Foundry	11 40@11 65	Valley Scotch No. 2	11 15
No. 2 Strong Foundry	10 90@11 15	Gray Forge, valley	10 00@10 25
No. 3 Foundry	10 65@10 90	Lake Superior Charcoal	12 50@13 50

FINISHED MATERIAL.—Sheets are higher this week, No. 27 being now quoted 2c Pittsburg, and galvanized sheets, 75 and 10 per cent discount. The demand for plates is beyond any ability of the mills to meet deliveries asked. The vessel business pending—three boats for the Bessemer Steamship Co.—calls for September and later deliveries, the total being about 5,000 tons of plates and 2,500 tons of shapes. We quote plates at 1.50c for tank and higher prices are being paid to get special deliveries. The business in bars is accumulating, and 1.10c Pittsburg for steel is minimum, with 1.15c obtained by some mills. The volume is large and so well booked are the mills that large orders carrying forward deliveries are quoted at an advance over current prices. Some bridge business has been taken by Cleveland builders, but all material now coming from the mills and the shipments for months ahead are on the basis of 1.20c Pittsburg for beams and channels, the 1.30c price being realized thus far on small current orders. Bar iron holds to 1.05c Cleveland. The mills are well filled up and are getting slight advances.

WIRE AND WIRE NAILS.—Rods are no longer a factor in the market, though shipments from Cleveland have been made on old contracts. An advance of $2 a ton was made on Feb. 6 in the price of wire and wire nails. The jobbing base on wire nails is now $1.60; in single car lots, $1 65; less than car lots, $1.70. Plain wire has advanced to $1 45, and galvanized to $1.85. There is a good movement in all wire products.

OLD MATERIAL.—Foundries and mills have been buying steadily and dealers have call for more material in some lines than they can get. We quote old iron rails at $14.50, valley; old steel rails, $9.75 to $10; car wheels, $11; machinery cast scrap, $9; No. 1 wrought, $12; wrought turnings, $7.25; cast borings, $6.25. Recent advances range from 25 to 50 cents.

CINCINNATI.

Feb. 7.

There has been a steady demand for pig iron. No very large lots have been asked for, but during the week quite a number of inquiries have been made, ranging from 100 to 500 tons. In the aggregate these amount to a good deal and there has been quite a little selling, principally of course of Northern irons. The prices of Birmingham metal are now so high that Virginia iron has been sold as far west as Indianapolis at much lower prices than the corresponding grades of Southern iron. Valley iron has been heard of, too, in unusual quarters. There is still an immense amount of difficulty in getting iron forward on contract time. However, there is nobody as yet actually suffering for iron. There have been half a dozen cases where consumers had to have iron or shut down, but they have managed to get it. It does look, however, as though the Southern furnaces were going to find it harder to live up to their contract obligations in March and April than at present. Predictions are made that $10 cash Birmingham and $11 cash Ohio furnaces for No. 2 foundry will be realized in the very near future. Sales have been made of Southern No. 2 foundry at $9.25 and No. 1 soft at $9.50 Birmingham. We quote for cash f. o b. cars Cincinnati: Southern coke, No. 1 foundry, $12.25; No. 2, $12; No. 3, $11.50 No. 4 and gray forge, $10.75; mottled, $10.75; No. 1 soft, $12.25; No. 2, $12; Hanging Rock, charcoal, No. 1, $15.50 to $16; Jackson Co silvery, No. 1 $12.75 to $13; standard Georgia car wheel, $14.75 to $15.75; Lake Superior charcoal, $14.25 to $14.75.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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THE CONSOLIDATIONS.

United States Cast Iron Pipe and Foundry Co.

In our last issue it was stated that the reports concerning efforts to combine certain cast iron pipe foundries of the country were confirmed. With the week the prospectus of the United States Cast Iron Pipe & Foundry Co. has been issued. It is proposed to unite into one concern the following: Lake Shore Foundry, Cleveland, O.; McNeal Pipe & Foundry Co., Burlington, N. J.; National Foundry & Pipe Works, Ltd., Scottdale, Pa.; Buffalo Cast Iron Pipe Co., Buffalo, N. Y.; The Ohio Pipe Co., Columbus, O.; The Addyston Pipe & Steel Co., Cincinnati, O. (having works at Addyston, O., and Newport, Ky.); Dennis Long & Co., Louisville, Ky.; American Pipe & Foundry Co. (having works at Chattanooga, Tenn.; South Pittsburg, Tenn; Bessemer, Ala.; Anniston, Ala., and Bridgeport, Ala.).

The company will be authorized to issue $15,000,000 7 per cent non-cumulative preferred stock and $15,000,000 common stock. Of this $3,000,000 of preferred stock and $3,000,000 common stock are to be retained in the treasury for the purchase of additional companies and plants. Of both issues, $12,000,000 will be issued to acquire the properties named above and for working capital. The present output of cast iron pipe is stated to be 600,000 tons per annum, of which the new company will be able to supply 450,000 tons, on which the minimum annual net profits will, it is said, be not less than $3 per ton—a total of $1,350,000; other profits are estimated at $250,000, a total of $1,600,000. Seven per cent dividends on $12,000,000 preferred stock would be $840,000, and 5 per cent on $12,000,000 common stock, $600,000, a total of $1,440,000, leaving a surplus of $160,000. The new company will have a working capital, manufactured product and cash, of $2,000,000.

To provide cash for the treasury of the new company and for the carrying out of the foregoing plan, Poor & Greenough, of New York, are authorized to offer $7,500,000 preferred stock for subscription at par, with an equal amount of common stock. The firm has issued subscription blanks in connection with the prospectus. The consolidation, it is believed, will result in material saving in freights; in the common use of patents and economic devices and reduction in general expenses and sales from consolidation of executive and selling offices.

It is expected that some weeks will be required to complete the appraisal and other preliminaries.

American Car and Foundry Co.

The prospectus of the American Car & Foundry Co., organized under the laws of New Jersey, has been issued. The capital stock will be $30,000,000 7 per cent non-cumulative preferred stock and $30,000,000 common stock. Of these amounts $2,400,000 each of the preferred and common stock are to be held in the treasury to acquire other property and make improvements and for other purposes. The following are included in the consolidation: Michigan-Peninsular Car Co., Detroit; Jackson & Woodin Mfg. Co., Berwick, Pa.; Missouri Car & Foundry Co., St. Louis; Ohio Falls, Mfg. Co., Jeffersonville, Ind.; Union Car Co., of Buffalo; St. Charles Car Co., St. Charles, Mo.; Wells & French Co., Chicago; Terre Haute Car & Mfg. Co., Terre Haute, Ind. The annual capacity of these companies is placed at 86,500 freight cars, 500 passenger coaches, 820,000 wheels, 125,000 tons castings, 30,000 tons pipe, and 90,000 tons of bar iron. Among the directors proposed is the name of Chas. T. Schoen, of the Pressed Steel Car Co., indicating that the consolidation expects to maintain a close relationship with the makers of steel cars.

Wrought Pipe Consolidation.

It is definitely stated that no agreement of purchase, sale or consolidation has been entered into by the National Tube Works Co., its large stockholders or its officers. The question has been raised, however, by outsiders whether certain wrought pipe tube companies could be joined in a combination through consolidation, and whatever may be the ultimate result, there is no definite outcome as yet. It has been reported that J. P. Morgan has been at work on the consolidation; but the pipe companies, it is said, have not known him in the negotiations thus far.

National Founders' Association.

The anniversary of the formation of the National Founders' Association came last week and the annual meeting was held at Buffalo. It was enthusiastic and largely attended. Owing to his expected absence from the country for the greater part of the year P. W. Gates, president of the Gates Iron Works, Chicago, declined a re-election and the announcement will be made shortly of his successor. Mr. Gates has done yeoman service in strengthening the association and making it a force in the foundry world, in the past year, and his retirement is regretted. In its short career the association has demonstrated that it is to be a conservative and influential factor in the foundry trade. It has not aimed at uniformity in wages but at their proper adjustment to conditions, so that employes in one establishment may not be reduced below what competing shops are paying, and that employers may not be compelled, through local pressure, to yield to unreasonable demands. Its executive committees have made decisions both for and against employers the past year, and have exhibited a conciliatory rather than an antagonistic spirit in their dealings with organized labor. The association has grown rapidly and has added to its membership many of the most extensive foundries in the country.

American Steel and Wire Co.

The high point reached by the stock of the American Steel & Wire Co. the past week was 97 for the preferred and 50½ for the common stock. It is announced from New York this week that the company has acquired two additional plants—those of the Puget Sound Wire Nail & Steel Co., at Everett, Washington, and of the Portage Iron Co., Ltd., Duncansville, Pa. The Everett plant has a capacity of 15,000 tons of wire a year. In the nail mill are 75 machines, with annual capacity of 300,000 kegs. The Portage Iron Co. has a rod mill with an annual capacity of 30,000 tons; a wire mill with 30,000 tons capacity; and 103 nail machines which on double turn can produce 500,000 kegs a year.

CONSIDERABLE has been published lately of the extensive operations in steel freight car construction intended by the Pressed Steel Car Co. This company heretofore has bought all the material used in car building, but it is now stated that it will erect a steel plant near Homestead. This report has not been confirmed by the company, but it is argued that it must make its own steel in order to compete with other car builders who work from the ore up. The company has received an order for 1,000 cars of 80,000 pounds capacity each, for the Union Pacific Railroad.

PERSONAL.

Wm. P. Palmer, general manager of the American Steel & Wire Co., has established his headquarters in Cleveland, in the Cleveland Rolling Mill Co. offices, Western Reserve Bldg. The latest announcement concerning official positions in the company was made this week. A. T. De Forest has been elected secretary of the Cleveland Rolling Mill Co., vice T. H. Taylor, who goes to New York as assistant general sales agent of the American Steel & Wire Co. R. W. Ney has been appointed assistant manager of the Cleveland District; A. S. Chisholm, assistant to the general manager; Joseph Waldeck, superintendent of Mill No. 2 in the Cleveland District—the American mill. Other positions in the Cleveland District remain as heretofore.

Ex-Congressman Tom L. Johnson confirms the report that he will retire from active business, turning the management of most of his interests over to his brother, and devote himself to the propagation of the single tax doctrine as originally promulgated by Henry George. In the case of several important holdings Mr. Johnson has sold out to his associates. He retains his interest, however, in the Lorain Steel Co. and in other properties at Lorain, O. It is stated that not only his time but his income will be devoted to the educational work he has undertaken.

H. R. Hall has resigned as assistant general manager of Dunbar Furnace Co., Dunbar, Pa., to return to Parryville, Pa. The furnace of the Carbon Iron & Steel Co. at Parryville, which has been idle for over a year is to be started up in the near future.

Col. John Lambert, on his return to Joliet, Ill., from the New York meeting of the American Steel & Wire Co., at which he was elected president, was given an enthusiastic welcome by his fellow citizens, the procession that met him at the depot including some hundreds of "his old employes of the Lambert & Bishop Wire Fence Co.," as one of the transparencies read.

In addition to the officers elected by the American Steel & Wire Co.'s directors at the recent New York meeting, whose names we have already reported are the following: Thomas H. Taylor, New York, assistant general sales agent; E. E. Stone, Chicago, general purchasing agent; Frank Baackes, Chicago, general superintendent; James S. Keefe, Chicago, general traffic manager; F. T. Bentley, Chicago, general freight agent; F. H. Daniels, Worcester, Mass., chief engineer; E. C. Lott, Chicago, manager, Chicago District; Wallace H. Rowe, Pittsburg, manager, Pittsburg District; Stephen W. Tener, Pittsburg, assistant manager, Pittsburg District; A. T. De Forest, Cleveland, manager, Cleveland District.

S. G. Valentine, Ph. D., has been appointed successor to Harry R. Hall as assistant general manager of the Dunbar (Pa.) Furnace Co. and general manager of the New Haven & Dunbar Railroad Co.

J. A. S. H. Baker, vice-president and general manager of the Baker Forge Co., Ellwood City, Pa., has tendered his resignation, to take effect at once. Mr. Baker's name has long been known in connection with the Baker wagon.

Kenneth Robinson has been appointed manager of all the furnaces operated by the Sloss Iron & Steel Co., Birmingham, Ala.

Raymond D. York should have credit for the engineering work of the extensive plant of the Burgess Steel & Iron Works at Yorktown, near Portsmouth, O., described in our issue of last week.

Superintendent George W. Jewett of the Rockdale plant, Joliet, Ill., of the American Steel & Wire Co., who has been identified with wire mills there for 16 years, will be transferred to New Castle, Pa., to take charge of the mills in that city. The four Joliet plants of the company—Rockdale, Railroad street, Scott street, and Meeker avenue—will be consolidated, and John Y. Brooks, at present superintendent of the Scott street mills, will be promoted to the position of general superintendent.

Cecil A. Robinson, who retires from the presidency of the La Belle Iron Works, of Wheeling, to become a district manager of the American Tin Plate Co., was presented with a gold watch and chain and a gold-handled knife by the directors of the La Belle works.

P. W. Gates, president of the Gates Iron Works, Chicago, who has been president of the National Founders' Association the past year, will start in a few weeks on an extended trip which will include European countries, South Africa and India.

Carnegie Steel Car Works to Make 100 Cars a Day.

The Carnegie Steel Co., Ltd., is booking orders for steel freight cars to be made in the steel car works now being built by the company. Orders for over 6,000 cars have already been received, one from the receivers of the Baltimore & Ohio for 2,000 cars, amounting to about $2,000,000. The original plans, which were drawn for a plant with a capacity of 40 cars a day, have been changed, and now contemplate a plant with a capacity for turning out 100 cars a day. The main building, in which practically all the work will be done, will be about half a mile long and 500 feet wide, and will be located at Homestead, on the south bank of the Monogahela River, and near the plate mills which are being erected to supply the plates for the car works. In this building the work will be practically continuous, the materials starting at one end and completed cars passing out at the other end. The steel plates will come from the new plate mills, the structural shapes from the structural mills of the company, the wheels from a plant which is to be erected for the purpose, and the axles from the present axle works, which will be enlarged. The present plant has a capacity of about 70,000 axles a year. The car works will require about 400 axles a day, or about 100,000 a year. The air brakes will be furnished by the Westingouse Air Brake Co., and outside of this all parts will be manufactured by the Carnegie Steel Co. The design will be quite different from that of the cars now in use as rolled structural shapes will replace to a great extent the pressed steel shapes. J. B. Hardie was appointed chief engineer of the car plant last week. He has been connected with the Carnegie interests for some time.

A Third Bid on Krupp Armor.

A Washington special says that the Midvale Steel Co., of Nicetown, Philadelphia, has offered to furnish the Government armor plate manufactured by the Krupp process. Capt. O'Neill, chief of ordnance, appeared before the House Naval Committee on Feb. 4 at a secret session, and explained the Midvale Steel Co.'s proposition. It is not stated what the company proposes to provide in the way of equipment for the manufacture of armor, nor how long a time it would require to be in shape to furnish such plates. At present it has a steel casting and forging plant.

Fewer Tuyeres for Sparrow's Point Furnace.

Furnace C of the Maryland Steel Co., Sparrow's Point, Md., was successfully blown in on Saturday, Feb. 4, the first cast being No. 1 Bessemer iron. The furnace has been relined recently and will run on a mixture of Cuban and Lake ores (Mesabi), and possibly later on all-Cuban ores. When last in blast the furnace had 16 tuyeres, but has now gone back to 8 tuyeres. Its capacity is 300 tons a day and upward.

THE Pittsburg Locomotive Works has been asked to bid on 40 locomotives of 80 tons weight, and eight locomotives of 100 tons each, for the Union Pacific Railroad. Delivery is to be made not later than June.

SEVERAL weeks since mention was made of the fact that a tract of land owned by the Pittsburg Plate Glass Co. was being negotiated for by the Carnegie Steel Co. The land is that occupied by the old Howard Plate Glass Works, absorbed by the plate glass consolidation, and is located south of the Carnegie Steel Co.'s land at Duquesne. On Tuesday of this week the sale was unanimously ratified by the stockholders of the plate glass company. There are 27 acres in the tract, and the price paid is $275,000.

THE Western Foundrymen's Association will hold a smoker at the Great Northern Hotel, Chicago, Wednesday evening, Feb 15. An amendment to the by-laws will be considered, and the topical questions heretofore announced will come up for discussion.

SHEET MILL FEED TABLE.

F. I. Freeman, superintendent of the Totten & Hogg Iron & Steel Foundry Co., Pittsburg, has designed a method of removing from a rolling mill feed table any piece of metal without interfering with the movement of other finished material passing over the table. As represented in the illustrations, Fig. 1 is a partial plan view of the improved feed-table, and Fig. 2 is a vertical cross section. The novel feature is the combination with the feed-table of an electro-magnet so arranged that when energized it will deflect and remove an article passing over the feed-rolls. On the feed table is mounted a series of lower feed-rollers 5 which are positively driven by means of a sprocket chain passing over sprocket wheels upon the protruding ends of their shafts. Motion being communicated to one of these shafts will thus positively drive the entire lower series. As the table is particularly designed for carrying sheets, there is provided an upper series of idle-rollers 7, which are driven by frictional contact with the lower rollers or with the sheets passing between the two series. One of these upper rollers 7 is reduced in diameter and adjacent thereto is placed a pair of rollers 8, the upper of which is pressed against the lower by suitable springs. The rollers 8 are driven by gear connections with one of the rollers 5, or otherwise, as desired. An inclined shield leads from a point between two sets of the coacting driven and feed rollers over the reduced roller 7 to pass between the rollers 8 and is extended beyond them for some distance to act as a support for the removed sheets. Near the lower end of this apron or shield is placed an electro-magnet 11, carried on a standard and having suitable electric connections, leading through a switch 14, by which it may be energized. The handle of this switch is in convenient proximity to one of the stands of rolls, so that the attendant can readily control the magnet.

When a defective sheet passes from the stand of rolls and enters upon the feed-table, the attendant by means of the switch energizes the magnet, and as the sheet comes beneath it the magnet will draw its front end upwardly, so that the rollers 5 will force the sheet up along the apron until it is engaged by the rollers 8, and these rollers will complete the removal of the sheet from the table and force it along the apron extension.

The use of an electro-magnet does away with the necessity of moving mechanism to engage and remove a sheet from the table and is instantaneous in operation and easily and cheaply applied. Its use enables the operator to stand at any desired point and operate the switch which controls this magnet. Two or more magnets may be used, and the magnet may be arranged to move with the sheet, if desired, and other changes in the form and arrangement of the feed-table and of the magnet may be made.

Fig. 1.

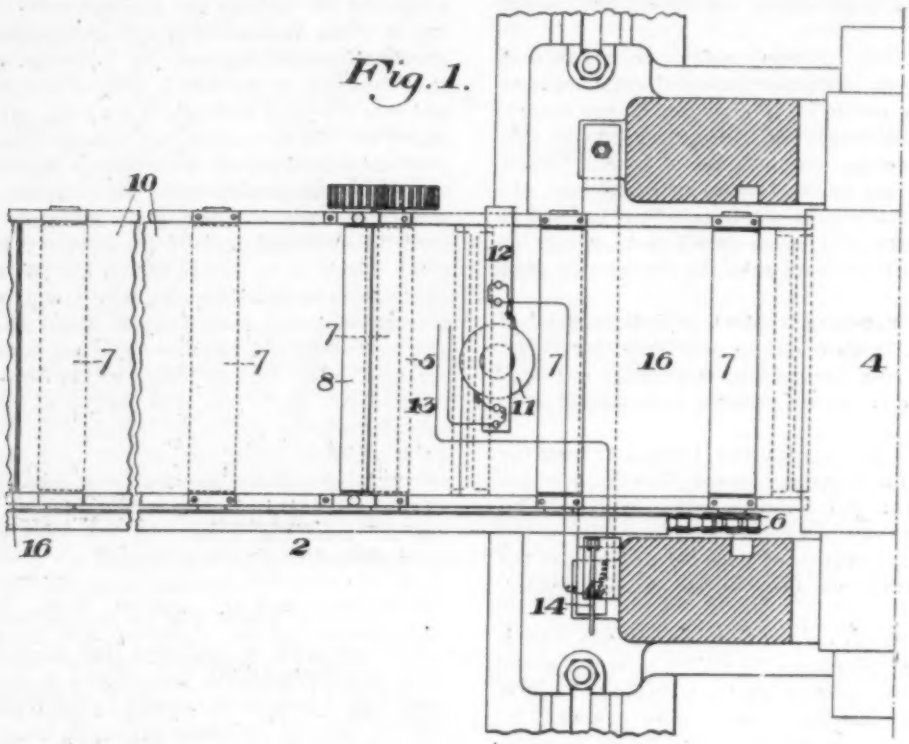
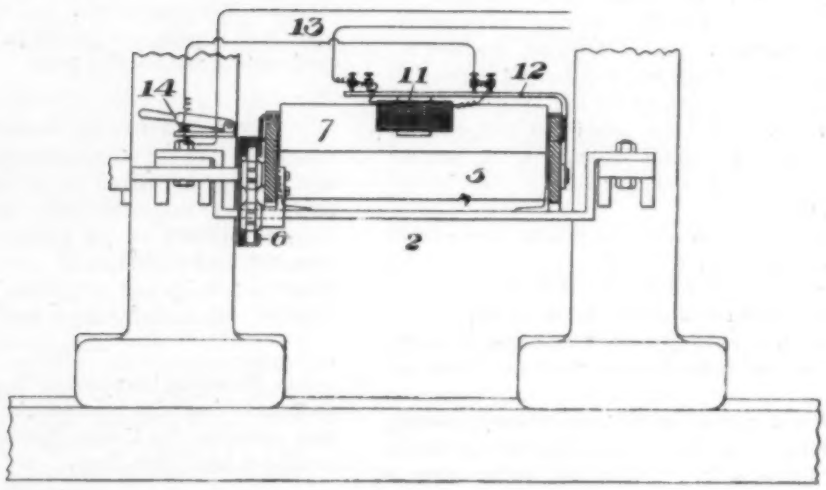


Fig. 2.



SHEET MILL FEED TABLE.

The Andrews & Hitchcock Iron Co.'s No. 1 furnace at Hubbard, O., will be rebuilt.

THE ORE SUPPLY FOR VIRGINIA FURNACES.

TO THE EDITOR:

In an article in one of your late issues you express a serious doubt as to the ability of the mineral deposits of Virginia to furnish the ore necessary to run the furnaces lately acquired by the Virginia Coal, Iron & Railway Co. In the promoters' circular the consolidation takes in nine furnaces—Bristol, Max Meadows, Dora, Radford-Crane, Graham, Salem, two Crozer and Buena Vista. The Ivanhoe, Pulaski, Roanoke and Shenandoah furnaces are not included.

If it were possible to start at once all of the above furnaces, whose yearly capacity can be conservatively placed at 400,000 tons, they would require 900,000 tons of ore. It is needless to say that no such quantity is now available; nor can it be had for some little time to come. The two Crozer and the Dora furnaces have been running straight along, and of course have their respective mines opened and in working order. Buena Vista can also be dismissed, as it is running exclusively on the Oriskany ores from the Chesapeake & Ohio Railroad, and enough of this can be had for several furnaces. It may be noted in passing that this little furnace, 16 x 70 feet, is averaging 160 tons a day of basic open-hearth iron, on a 44 per cent ore.

There remain to be taken care of, the Salem, Radford-Crane, Graham, Max Meadows and Bristol. Very considerable intervals separate these furnaces, and all, with the exception of Graham, lie near the base of the Blue Ridge, carrying the Potsdam ores. The Radford-Crane was never completed. The Salem and Graham would require new lining. The Max Meadows can be quickly blown in. I am not familiar with the present condition of Bristol; but it undoubtedly will require re-lining and other repairs. All of these are thoroughly good modern plants—not modern as compared with the Carnegie and Lorain, but well built, with fire brick stoves, double engines and ample yard and stockhouse facilities. The ore properties controlled by this new company could not be duplicated in Virginia at any price, because they could not be found. They embrace pretty much all of the good mineral lands for miles along the Cripple Creek range, carrying the high grade limestone ores, together with very valuable deposits of Mountain (Potsdam) ores in close proximity. At the close of the boom in '91 there had been enough mines (so-called) opened to give, say, 40,000 tons a month, had there been any demand. With a few exceptions all were being worked on a small scale. It will be a comparatively easy and inexpensive matter to clean out and open up these quarries, as they are all open cuts and nothing underground. You are perfectly right in saying that railroads must be built, machinery erected and improvements made; but none of these will be required on a large scale. A branch from Carter's Ferry on the New River to old Speedwell Furnace, as I recall it a distance of 10 or 12 miles, would run continuously over ground carrying the limestone ores and allow many new and large ore openings.

Around Foster Falls there are large proved deposits of the Potsdam ores. Assuming that the Max Meadows Furnace would be the first to go in blast, these ores would only have a 30-mile haul to it. Apart from this, the furnace company owns two and a half miles of narrow-gauge road, with its equipment, running from the furnace yard to the foot of Draper Mountain to its mining camp and washers. The extension of one mile to its Locust Hill mines would at once make available what shows from developments made to be a very large deposit of Mountain ore. There ought not to be any difficulty in promptly supplying this furnace with all the ore it requires.

If Salem Furnace is run on basic open-hearth iron, the River mines, only six miles distant by rail, which have been worked for years, and which are part of the largest deposit of Potsdam ore I know of in Virginia, ought with ease to give 10,000 tons a month, thus fully providing for this furnace.

The Radford-Crane has no ores in its immediate vicinity, and its supply would have to come from other points along the line of the Norfolk & Western Railroad. Satisfactory showings of ore are reported at Little River, 11 miles back, but to reach these a road must be built. The ores to supply this furnace, at the present time must be hauled from 30 to 50 miles.

Graham Furnace occupies a peculiar position. Within 10 miles of the Pocahontas coal, it was supposed that apparently large showings of brown ore only a few miles distant on the Clinch Valley extension of the Norfolk & Western, would afford an abundant and very cheap ore supply. It subsequently proved that these ores were on the sub-carboniferous slates, and were simply great cappings of ore on slate and sandstone and without depth. Prospecting was then begun on the other side of the great fault, and very considerable showings were made of an excellent ore lying in and on the limestones forming the valley at the base of East River Mountain, and through which the Bluestone flows. A branch of three miles was needed to reach these ores, but by this time funds were getting low, the "boom" was waning, and the furnace has since stood cold and lonely.

But another and most important source of supply is now available—the red fossil ores near Big Stone Gap. These can be mined at low cost with a moderate haul. There is a further possible source of supply not only to the Graham and Radford furnaces, but also to Dora and Max Meadows, of such importance that it would be unwise not to consider it—the great Oriskany field. A bridge across the New River and a branch 13 miles in length has been built from the Norfolk & Western to the timber and ores on the Mountain Lake estate. Several openings have been made in the ore and shipments made. At this point the Oriskany is lean and silicious, running only 38 to 40 per cent in iron. From what I have heard, more careful mining and preparation would bring this up three to five per cent. At frequent intervals, both along Craig and Potts creeks, this great Oriskany ore seam, worked so continuously and successfully at Longdale, Lowmoor, Ritch Patch, Dolly Ann and other mines, makes bold showings. A practicable railroad route can be had through this country, running from New River to the Chesapeake & Ohio. In these days the building of 30 or 40 miles of railroad to reach timber and ores is a bagatelle, and this connection once made the lower Norfolk & Western furnaces will have great stores of ore to draw upon.

One furnace remains to be considered—the Bristol. When this was built great expectations were based upon a red hematite in close proximity, but which proved a small abnormal pocket. During the short time it was in blast it ran on brown ores from Embreville, Tenn.—the magnetics from Cranberry, and the Gossan from Carroll county, Va. It is stated that the new company have bought the South Atlantic & Ohio and the Bristol & Elizabethton railroads. The former can bring the fossil ores from Big Stone Gap, and the latter will make available the brown ores in great abundance in Tennessee, and the magnetics from North Carolina. This furnace can then make, at will, an iron identical with that of Birmingham, Ala.—a basic open-hearth from the brown ores alone, or a special low phosphorus Bessemer from the magnetites.

In my judgment this consolidation is the most important industrial move ever made in Virginia. The furnaces and ore properties in the hands of various weak owners, were doomed to failure. Under the control of one strong organization, with ample capital to back it, it ought to be made a great business success, and make the whole section in which it operates prosperous. It must, of course, not stop short at making pig iron. It must turn its pig into at least steel billets. I venture nothing in saying that, with the cash it is said to control properly expended by a capable and economical management, the Virginia Coal, Iron & Railway Co. can deliver the highest grade of basic open-hearth steel at tidewater as cheaply as can be done by any other concern in the United States, without any exception. It will take a reasonable time and a reasonable amount of money to develop the mining properties to a point that will guarantee a full supply of ores to all the furnaces; but if I am not entirely mistaken as to the business abilities of the president and general manager, Mr. Geo. L. Carter, the time taken will be so short as to surprise pretty much every one.

I do not express any opinion as to the financial outcome of the enterprise. This depends upon too many contingencies. I simply desire to say that with a fairly full personal knowledge of the field, it is perfectly possible to supply at a low cost the quantity of ore needed to run the furnaces embraced in the consolidation.

EDMUND C. PECHIN.

Buchanan, Va.

OBITUARY.

Mathias Roos, Chicago, secretary of the Butler Street Foundry & Iron Works, died of pneumonia on Feb. 1. He had been ill but three weeks, pneumonia having developed from an attack of the grip. He was born in Woodlawn in October, 1852. For ten years he was connected with Tobin & Hamler, foundrymen, and seven years ago he established the Butler Street Foundry & Iron Works.

William H. Conner, superintendent of the Bessemer plant of the Carnegie Steel Co., at Bessemer, Pa., died last week. He was born in Cumberland, Md., and went to Pittsburg when quite young, accepting a position with Macintosh, Hemphill & Co. He rose rapidly until he became superintendent of the foundry, remaining with this company for 30 years. About five years ago Mr. Conner resigned to accept the superintendency of the Bessemer plant of the Carnegie Steel Co.

John Macbeth, for 46 years a well known foundryman of Cleveland, died Feb. 4, aged 70 years. He established the Macbeth Foundry Co. in 1869, its product being architectural iron.

Major Jed. Hotchkiss, who was very prominent in developing the mineral resources of Virginia, died at his home in Staunton, Va., Jan. 17, aged 70 years.

A wide circle of friends in Pittsburg and elsewhere will learn with regret of the death of Frederick L. Geist, vice-president and treasurer of the Shiffler Bridge Co., Pittsburg, on Monday, Feb 6, aged 38. Mr. Geist was at Redlands, Cal., whither he had gone to recuperate. Death was the result of pulmonary trouble.

More Furnace Capacity.

The Ella Furnace at West Middlesex, Pa., formerly owned by Boyce, Wheeler & Co., was sold to Pickands Mather & Co., under court order, on Jan. 31. The price is reported to be $35,000. The furnace has been idle for two years and repairs will be needed. Wheeler boilers will be put in and other equipment, the work requiring about 60 days. The stack is 70 x 14 feet.

The Brown-Bonnell Iron Co., of Youngstown, O., has an option on a lease of the Sharpsville (Pa.) Furnace of the Sharpsville Furnace Co. The furnace has not been operated since the summer of 1898. It is 65 x 15 feet. The Youngstown company formerly operated a furnace of its own, the Falcon, but has not manufactured pig iron for several years. If the Sharpsville furnace is taken it will be run on mill iron.

There have been some negotiations looking to the starting up of the Calumet Furnace, at South Chicago, but the matter is not definitely decided. The stack is 80 x 18 feet.

A CHARTER has been filed at Trenton, N. J., of the Merchants' Wire & Nail Co., with a capital of $500,000 common and $500,000 7 per cent preferred stock. The incorporators named in the charter are Clement N. Biddle, Robert Biddle, and William B. Knight, all of Philadelphia. Of the capital stock $200,000 is paid in. The names of stockholders are not given, nor are any other details except the statement that the company will erect a rod mill at Pittsburg, one in the East and one in the West.

THE Domhoff & Joyce Co., Cincinnati, O., has opened an office at 702 Fisher Bldg., Chicago, for the sale of pig iron and Stonega coke in Chicago and tributary territory. The office will be in charge of C. E. Louis, sales agent. Mr. Louis has been favorably known to the foundry trade of Chicago and vicinity for a number of years, having been connected with the sales departments of the Iroquois Furnace Co. and with Rogers, Brown & Co.

SAMUEL M. SHIMER, dealer in metals, Perry-Payne Bldg., Cleveland, bought the Pennsylvania Brass Works, Erie, Pa., at sheriff's sale last week, and will operate the plant under the name of the Pennsylvania Brass Co. The product is brass goods for steam, gas, water and oil plant uses—cocks, valves, whistles, etc. A good trade has been built up in the company's specialties, which promises to be extended under the new management.

PNEUMATIC HOISTS FOR SHOP USE.

Pneumatic hoists of different styles are extensively used in machine and boiler shops, foundries, shipyards, bridge works, slaughter houses, breweries, factories in every branch of trade, in all places, in fact, where it is necessary to raise heavy loads frequently and expeditiously. The type of hoist in most general use, and the one possessing the widest range of adaptability, is the ordinary direct-acting, straight-lift hoist. This is simply a cylinder suspended from the top end, and fitted with a piston and piston rod, the latter having a hook at its lower end for receiving the weight. In the smaller sizes of these hoists, the cylinder usually consists of ordinary brass tubing with cast heads held in place by tie rods passing through the heads and secured by nuts. In the larger hoists, the cylinder is a casting, bored out to the proper diameter.

When the nature of the service permits, the hoists are suspended in a fixed and permanent location, but their greatest field of usefulness is realized by suspending them from a trolley running on an overhead rail. When so arranged, the air-supply hose is sufficiently long to permit the hoist to be moved the entire length of the overhead rail. The hose is wound upon a drum and passes over idlers arranged alongside of the rail, a spring being utilized for rewinding the hose upon the drum as the hoist returns.

Another method is to disconnect the hose from the hoist when necessary, by means of a convenient coupling, the escape of air being prevented through the automatic closing of the valve by the air pressure. With this arrangement, the range of travel of the hoist with its load is unrestricted. The hoist requires no labor other than the manipulation of a three-way valve, and the load may be held at any point at will. The speed of lifting is variable, being entirely under the control of the operator, and the workman does not have to wait for slowly moving mechanism, as in chain hoists.

Horizontal cylinder hoists may be used in cases where head room is lacking, and these are constructed in a variety of forms; but whenever the conditions will permit, whether upon cranes or otherwise, the vertical direct-acting type is preferable, as it is more easily operated, is higher in efficiency, and lifts more evenly and smoothly than the other type.

When it is impossible to utilize either the vertical or horizontal hoists, the air motor hoist may be used to advantage. In this device the common differential chain hoist is provided with an air motor fitted between the side plates which form the frame of the hoist.—[W. P. Pressinger, in Cassier's Magazine for February.

The Champion Mine.

An interesting account of the latest developments at the Champion mine is given in *Iron Ore*, of Ishpeming, Mich. The mine is referred to as differing from most others in having a true vein, which has been followed to a greater depth than any other, unless it be the Republic, its lowest workings being 1,500 feet vertically from the surface. Nine shafts have been sunk, of which six are abandoned. The active ones are in the western end of the mine. No. 7 shaft is the one on which hopes of future product depend. It follows the dip of the vein to the 12th level where it ran into ore, and it was decided to change it to a vertical shaft which it has followed to the bottom, the 20th level. Mr. Walter Fitch, the company's agent, has decided to give it a spiral turn, beginning at the 19th level. "At this level the shaft bears 17 degrees west of north and it is proposed to so change its course that it will bear 62 degrees west of north, the completed change to be made in a distance of 175 feet from the 19th level, which will give an easy turn and one that will be practicable in the operation of the skips. Mr. Fitch has figured this all out, and to avoid any possibility of mistake had a model the full size of the skip track constructed upon surface, where all the detail was perfectly arranged." It will be the first spiral shaft in the Lake Superior region.

ROGERS, BROWN & CO. issue a circular making the following statement of their business in 1898, as compared with 1897:

	1898	1897
Pig iron sold . . .	1,001,356 gross tons.	775,345 gross tons.
Pig iron delivered .	819,660 "	607,358 "
Coke sold	253,270 net tons.	155,209 net tons.
Coke delivered . .	143,387 "	70,837 "

The sales of mill cinder in 1898 were 9,600 net tons. The export sales of pig iron in 1898, included in pig iron deliveries above, were 78,460 gross tons.

Review of the Technical Press.

[Translation, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

Cast Iron in Railway Practice [*American Engineer and Railroad Journal.*]—Mr. A. E. Outerbridge, Jr., contributes an interesting letter bearing upon this subject, in which he discusses the rationale of the ferromanganese addition to ladles full of wheel metal just before casting. He quotes from his lecture delivered before the Franklin Institute in March, 1888: "That manganese, which is supposed to harden pig iron, really does not do so. It produces a marked effect upon the chill, making it look coarsely lamellar, but though the metal looks nice and white it is not hard, crumbling readily under impact. The effect of adding powdered ferromanganese to the iron is to raise its transverse strength, decrease the shrinkage and depth of chill, the cause very probably being the deoxidizing effect of manganese which leaves the metal purer and stronger. A further effect is the increased formation of graphite." This explanation would seem very good, but some questions might be asked: Does not the addition of ferromanganese disturb the temperature conditions of the ladle full of metal? And does not a change in temperature, on pouring irons so sensitive to changes of heat and consequent graphite proportions, have something to do with the last effect noted? The field is an interesting one, and Mr. Outerbridge evidently was the first one to perfect the process of using ferromanganese in the ladle. The wheel casting fraternity is greatly indebted to him for this work. In spite of adverse criticism in Europe on our wheels, the editor of the *American Engineer and Railroad Journal* states that "the cast iron wheel with chilled face, as made by our best manufacturers to-day, is a product to be proud of. It is not the result of accident, but of scientific study of the highest order."

The "Theisen" Process for Cleaning Blast Furnace Gases and Saving By-Products in Coking. [*Stahl und Eisen*, Jan. 15.]—Mr. Zimmersbach describes this interesting process which deals with one of the questions of the day in the iron world. The idea of utilizing the waste gases for power purposes, the saving of the by-products in coking, and, the reviewer predicts, the enforcement of city ordinances to abate the dust and smoke nuisance where blast furnaces are within town limits, all combine to subject new devices and processes in this line to close scrutiny. It is impossible to settle out the dust in blast furnace gases by quiet storage, for the quantity is too great. The "Theisen" process uses a centrifugal scrubber which brings the gases into intimate contact with the cooling water and takes out the very finest particles of dust with ease. An artificial draft is created by the mechanism corresponding to 1" to 1¼" water, the gases traveling at the rate of 150 to 200 feet a second. The water which has taken up all the dust is drained into a settling basin and used over again. The apparatus being very efficient can be of comparatively small dimensions. Thus if it is 7 feet high and 8 feet in diameter 10,600 cubic feet a minute will be taken care of. The old style scrubbers, which were very large and not nearly as efficient as this apparatus, cost about $8,000 to $10,000, and therefore make the installation of a large plant a very expensive matter. As this centrifugal scrubber not only pushes the gas along, but also sucks it in, special exhaust engines can be dispensed with. The idea is to mix thoroughly very thin layers of the gases with the water or lye. For saving by-products it is found that the tar is first thrown out of the gases, and in so doing it serves to help catching the succeeding particles. In the next drum of the apparatus the use of special fluids promotes the enriching of the ammonia water. Cooling towers are not necessary, as the tar is completely removed and, moreover, it is nearly free from water on account of the initial high temperature of the gases at the place of separation. Benzol is washed out in a similar manner, the final removal of the ammonia from the crude wash water and the benzol from the oils being effected in contrivances built on the same principles as the original machine, the original heat of the impure gases being used to hasten this separation. The final continuous distillation of the tar is also carried on in such centrifugal still, and the price of the whole outfit is so much lower than the present devices that a great future should be assured to this method.

The Life of Ingot Molds. [*Stahl und Eisen*, Jan. 15.]—Mr. August Zugger, superintendent of the Trzynietz Steel Works in Austro-Silesia, contributes a note on the above subject. Referring to Mr. Zimmersbach's article, reviewed in these columns in the issue of Jan. 26th, he gives the composition of the ingot molds made by the "Concordia" Blast Furnace in Sulzau-Werfen, Salzburg, which outlast 200 to 300 casts. This iron is, however, a charcoal variety, and has a rather low percentage of silicon. The analysis is as follows: Silicon, 1.27; manganese, 1.29; phosphorus, 0.147; sulphur, 0.061; graphite, 3.293, and total carbon, 3.870. Ingot molds of square cross-section last much longer than the oblong ones, the unequal expansion in the latter causing the small sides to crack at the lower end. To correct this evil a patented process introduces coils of wire in the thickened end, and this device is said to be very serviceable for the smaller ingot molds.

Fire Brick Manufacturers in Conference.

A meeting of manufacturers of No. 1 fire brick was held in the Park Building, Pittsburg, Feb. 2, in the office of V. L. P. Schriver, representative of the Union Mining Company, Mt. Savage, Md. The meeting was called that an effort might be made to bring together the manufacturers of No. 1 fire brick, or rather those which use a No. 1 fire clay, and stop the severe price-cutting which has been a feature of the fire brick trade for some years past. There were present at the meeting representatives (mostly sales agents) from the following manufacturers: Union Mining Co., Mount Savage Fire Brick Co., Harbison & Walker Co., Queen's Run Fire Brick Co., Phillipsburg Fire Brick Works, Isaac Reese & Son, Clearfield Fire Brick Co., Savage Mountain Fire Clay Co., Union Fire Clay Co., and Kier Bros. Those in the movement do not admit that it is the desire to go further than make an arrangement whereby uniform and remunerative prices can be secured. While fire brick is graded as No. 1, No. 2, etc., the No. 2 of a maker who turns out also No. 1 is better than the product of a maker who makes only No. 2, because the former makes both grades from the same grade of clay, and it is the intention to include in the arrangement only the manufacturers using clay from which No. 1 brick can be made. It is reported that those who are foremost in the movement have been in the front in the matter of price-cutting in the past two or three years, making rates which other manufactures were unwillingly forced to meet. The arrangement will not include the irregular shapes used in steel works for bottom casting ingots, and for other purposes. After a long discussion of various ways and means for accomplishing the desired result, the matter was left in the hands of a committee, which is to report to a full meeting Thursday of this week at the same place. The committee is as follows: John Richardson, representing the Clearfield Fire Brick Co.; F. H. Wigton, of the Phillipsburg Fire Brick Works; V. L. P. Schriver, representing the Union Mining Co.; H. A. Kennedy, representing the Queen's Run Fire Brick Co., and J. A. Bickford.

THE brands of the Standard Paint Co.'s products, of which announcement is made elsewhere in this issue are the P. & B. preservative paints, the P. & B. roof paint and the P. & B. ruberoid roofing. The first named is especially adapted to preservative uses, in application to wood or iron. It is entirely impervious to acid or alkali and is waterproof, acting as a complete preventive of rust or corrosion. Its use is extensive among ice machine and refrigerator manufacturers, brewers, cold storage companies, cider and vinegar manufacturers and silver and nickel plating companies. The P. & B. roof paint is made without oil or tar and is proof against drying out, cracking or blistering under the sun or from heat from the interior of the building to which it is applied. It is recommended for application to metal roofs where rust pin holes have made their appearance, an application being sufficient to stop leaks for a considerable period. The ruberoid roofing is put forward as conspicuously strong, durable and well prepared. It is extensively used on buildings whose roof coverings are subjected to the severest tests—foundries, chemical works, fertilizer and phosphate works,—and has fulfilled all requirements. It does not contain tar and is guaranteed against drying out, becoming brittle, or cracking with age. The Standard Paint Co., 81 John st., New York, will furnish testimonials and descriptive matter on application.

BLAST IN CUPOLA MELTING.*

BY DR. EDWARD KIRK.

A cupola furnace requires a large volume of air to produce a thorough and rapid combustion of fuel in the melting of iron or other metals in the furnace. Numerous means have been devised for supplying the required amount of air among them the draught of a high chimney or stack, and the creating of a vacuum in the cupola by means of a steam jet, placed in a contracted outlet of a cupola. These means of supplying air are a success in cupolas of small diameter and limited height, but even in these cupolas the volume of air that can be drawn in is not sufficient to produce rapid melting, and it is doubtful if iron could be melted at all in a cupola of large diameter and of a proper height to do economical melting, by either of these means of supplying air. Owing to the peculiar construction of a cupola furnace and the manner of melting, the free passage of air through it is restricted by the iron and fuel required; and rapid melting can only be done when air for the combustion of the fuel is supplied in a large volume, which can only be by a forced blast.

A number of machines have been devised for supplying this blast, among the earliest of which was the leather bellows, trompe or water blast, chain blast, cogniardelle or water-cylinder blast, cylinder or piston blower. These have, as a rule, given way to the more modern fan blower and rotary positive blast blower. The relative merits of a positive and non-positive blast is a very much disputed question. It is claimed by many that with a positive blast a definite amount of air is supplied to a cupola per minute or per hour, while with a non-positive blower or fan there is no certainty as to the amount of air the cupola will receive. This is very true, for a cupola certainly does not receive the same amount of air from a fan blower when the tuyeres and cupola are beginning to clog as it does from a positive blower when there is no slipping of the belts. But is it advisable to supply a cupola with as large a volume of blast when in this condition as when working open and free? Does not the large volume of blast have a chilling effect upon the semi-fluid mass of cinder and slag, and tend to promote clogging about the tuyeres while keeping it open above the tuyeres; while blast from a non-positive blower would percolate through small openings in the mass, and be more effective than a large volume of blast from a positive blower forming large openings in it through which it escaped into the cupola?

These are questions we have frequently tried to solve by actual test; but it is so difficult to find two cupolas of the same dimensions melting the same sized heats for the same class of work, one with a positive and the other with a non-positive blast, that we have never been able to test the matter. We have melted iron with nearly all the blowers now in use and with a number of the old-style ones, and think there is more in the management of a cupola than there is in a positive or non-positive blast. Good melting may be done with either of them, when the cupola is properly managed, and it cannot be done with either of them when the cupola is not properly managed. Until the management of cupolas in everyday practice is reduced to more of a system than at present, it will be impossible to determine any practical advantage in favor of either blower over the other. So far as we are concerned, we have no preference in blowers, but make it a rule to charge a cupola more openly when melting with a non-positive blast, for the reason that stock may be packed so closely in a high cupola, that the volume of blast that is permitted to enter at the tuyeres may not be reduced by preventing its escape through the stack.

The amount of air that is required for combustion of the fuel in melting a ton of iron has been determined by accurate experiments to be about 30,000 cubic feet, in a properly constructed cupola in which the air was all utilized in combustion of the fuel. This amount of air if reduced to a solid would weigh about 24,000 lbs., or more than the combined weight of the iron and fuel required to melt it. In a cupola melting 10 tons per hour, 300,000 cubic feet of air must be delivered to the cupola per hour to do the work. It will thus be seen that a very large volume of blast is required in the melting of 10 tons of iron. To deliver this amount of air to a cupola from a blower that is capable of producing it in the shape of a blast, the blast pipes must be arranged in such a way that the velocity of the air is not impeded by the pipes; and the tuyeres must be of a size to admit the air freely to the cupola. This is not always the case, for we have seen many cupolas in which the combined tuyere area was not more than one-half that of the blower outlet. The object in making the tuyere area so small was to put the air into the cupola with a force that would drive it to the center of the stock. This was the theory of melting in the old cupolas with small tuyeres, but this is wrong, for air cannot be driven through fuel in front of a tuyere as an iron bar could be forced through it, even with a positive blast; and when the air strikes the fuel it cannot pass through it, but escapes through the crevices between the pieces of fuel. These crevices may change its direction entirely, and the same force that drives it into the cupola impels it in the direction taken, which will be the readiest means of escape, and is more liable to be up along the lining than toward the center of the cupola. For, as a rule, stock does not pack so close near the lining as toward the center, and the means taken to prevent the escape of blast around the lining is the very thing that causes it to escape in that way. Since blast cannot be driven through fuel to the center of a cupola and only escape from the tuyeres through the crevices between the pieces of fuel, the only way to force it to the center of a cupola is to supply a sufficient volume of blast to fill all of the crevices between the pieces of fuel. This can only be done by discarding the small tuyeres and using a tuyere that will admit blast freely to a cupola.

In placing tuyeres in a cupola, it must be remembered that the outlet area of a tuyere is governed by the number of crevices between the pieces of fuel in front of the tuyere through which the blast may escape from the tuyere. With small tuyeres a large piece of fuel may settle in front of the tuyere in such a way that the tuyere outlet is not equal to one one-hundredth part of the tuyere area, in which case the tuyere is rendered useless, and may remain useless throughout the heat. For these reasons small tuyeres should never be placed in a cupola. For small cupolas we should recommend the triangular tuyere, for the reason that it tends to prevent bridging, and its shape is such that it is less liable to be closed by a large piece of fuel than a round tuyere of equal area. The vertical slot tuyeres are also for the same reason good tuyeres for small cupolas.

For large cupolas we think the expanding tuyere is the best, and if we were constructing a large cupola we should use this tuyere in preference to any other, and make the outlet at least double the size of the inlet, and should place the tuyeres so close together that the outlets would not be more than six or eight inches apart. This would practically give a sheet blast, and distribute air evenly to the stock all around the cupola. The width of the tuyere can be made to correspond with the diameter of cupola, and may be from three to six inches, and should be of a size that will permit blast freely to enter the cupola. Parties who have been melting with small tuyeres and put in large ones upon this plan, must change their bed and charges to suit the tuyeres, for this arrangement of tuyeres would probably be a complete failure in a cupola charged in the same way as when not more than one-fourth of the blast supplied by the blower entered the cupola.

The largest cupolas in which air can be forced to the center from side tuyeres with good results would appear from actual test to be from four and a half to five feet. Larger cupolas than this have been constructed, and are now in use, but they do not melt so rapidly in proportion to their size as those of a smaller diameter. To illustrate this, we might cite the Jumbo Cupola of Abendroth Bros., Port Chester, N. Y., already described, in which the diameter at the tuyeres is 54 inches, and above the bosh 72 inches, in which 15 tons of iron have been melted per hour for stove-plate and other light castings.

The Carnegie Steel Works, Homestead, Pa., have cupolas of seven and one-half feet diameter at the tuyeres and 10 feet diameter above the bosh, in which the best melting per hour is only 14 tons. The area of this cupola at the tuyeres is almost three times that of Abendroth's cupola, yet the amount of iron melted per hour is actually less than that of the smaller cupola. Tuyeres have been arranged in different ways in this large cupola, and from one to four rows used, yet the melting was not in proportion to the size of cupola. This

*From a new work on Cupola Practice now in press.

would seem to indicate that the cupola was not properly supplied with blast near the center, and the melting done in the center was caused principally by the heat around it; which is probably the case, for the cupola is kept in blast night and day, for six days, and melting must take place in the centre, or the cupola would chill up.

There are many cupolas of 60 inches diameter at the tuyeres in use in which good melting is done, but this would seem to be the limit at which good melting takes place in a cupola supplied with blast from side tuyeres, for above this diameter the rapidity of melting does not increase in proportion to the increase in size of cupola.

There has been considerable experimenting during the past two or three years with a center blast tuyere for admitting blast to the center of a cupola through the bottom. We have had no practical experience with this kind of tuyere for the last 25 years, when we placed one in a small cupola with side tuyeres and found no advantage in it; probably for the reason that a sufficient quantity of air for an even combustion of the fuel was supplied to the center of the cupola from the side tuyeres. During the past two years we have visited a number of foundries in which the center blast was being tried, but in every case the tuyere was out of order or not in use at the time of our visit. The great objection to this tuyere seems to be its liability to be filled with iron or slag and rendered useless. Should this objectionable feature be overcome by such practical foundrymen as Mr. West or Mr. Johnson, who are experimenting with center blast, it would certainly be a decided advantage in melting in cupolas of large diameter, in connection with side tuyeres. In cupolas of small diameter with side tuyeres, we do not think a center blast would increase the melting capacity of a cupola, for the reason that air can be forced to the center of a small cupola from side tuyeres, when properly arranged and of a proper size. With a center blast alone, it is claimed that considerable saving is effected in lining and fuel. It is reasonable to suppose that a saving in lining might be effected by a center blast; for the most intense heat that is created by the blast is transferred from near the lining to the center of the cupola, and the tendency to bridge is greatly reduced. As to the saving of fuel, there never was a new tuyere that did not "save fuel," and there have been hundreds of them, but consumption of cupola-fuel is still too large.

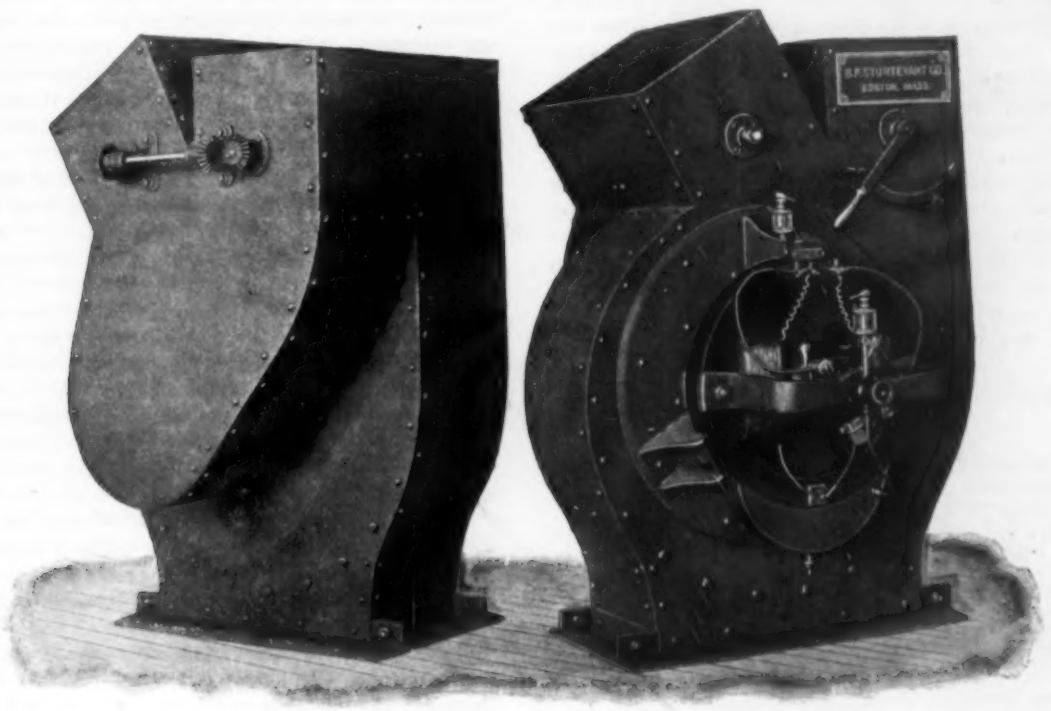
At the annual meeting of the Coe Brass Mfg. Co., of Ansonia and Torrington, Conn., Feb. 2, the directors voted to increase the capital stock from $325,000 to $1,000,000. They elected the following officers: President, Charles F. Booker; vice-president, Elisha Turner; treasurer, Edward T. Coe; secretary, James A. Doughty.

ELECTRIC FANS WITH ADJUSTABLE OUTLET.

A novel type of electric fan designed by the B. F. Sturtevant Co., of Boston, Mass., for use on certain vessels in the United States Navy is shown in the accompanying illustrations. The fan throughout is of steel plate, and is provided with an inlet casing or connection on the back. This casing is provided with two inlets, and the fan proper with two outlets, each corresponding with the former, but from which they are separated by diaphgrams, not appearing in the illustrations.

In these combined outlet and inlet connections are dampers arranged to be operated by the locking lever and connecting bevel gears, so that if for instance air is to be discharged through the outlet which appears on the right hand side of the fan, the inlet upon that side will be closed, the outlet in the inclined opening to the left will be closed, and the inlet in the same opening will be opened. A change in the position of the lever will exactly reverse this relation. By this arrangement it is possible to draw air from out of doors and force it into a given apartment, or by the manipulation of dampers to draw it from the given apartment and force it out of doors.

The motor which drives this fan is of the bi-polar type with wrought iron magnet ring, which is supported by and attached to lugs, projecting from a plate, which in turn is attached to the fan side. A very rigid support is thus provided. The field winding on the two pole pieces is of such design as to utilize the space to the greatest advantage. The armature is of the drum wound type. Carbon brushes carried in reaction brush-holders are employed. Thorough attention is given to the oiling of the bearings. These are formed in yokes projecting from both sides of the magnet ring and are provided with ring oilers. All overflow oil is conducted by a tube to a receiving tank below. The entire arrangement is compact and portable, there being no external support for the motor. It will be apparent that the steel plate construction makes possible almost any arrangement of inlets and outlets.



ELECTRIC FANS WITH ADJUSTABLE OUTLET.

The Largest Gas Engine Plant.

A very large gas engine plant is to be installed at the Lot's Road pumping station of the London County Council. It is to be supplied by Messrs. Crossley Bros., of Manchester, and will consist of eight double cylinder horizontal gas engines, four of 260 h. p. each and four of 210 h. p. each. There will also be four small engines of five h. p. each, combined with air compressors and hydraulic pumps. *Engineering*, which gives these facts, says that this will be probably the largest gas engine plant in existence.

AMERICAN COMPETITION IN THE GERMAN IRON MARKET.—II.

BY JACOB MUENCH.

An important consideration in connection with exports of iron from the United States in the past year, is that selling prices in the home market have been on so low a level that the works in Pennsylvania, Ohio and Illinois, as Mr. Carnegie stated in a recent interview, have in most instances little more than paid expenses. Notwithstanding their low costs, American works, on account of freight and foreign duty, can only deliver goods on the Continent of Europe at a loss. Sending products to free-trade England is, of course, another matter. It is not generally known and it does not appear from the monthly statements of the Treasury Department at Washington, that there has been any considerable export of iron and steel from the Northern States of the Union to Continental Europe; but it is well known that for three or four years the blast furnaces of Alabama have made every effort to gain a foothold in the European continental market, and have delivered several thousand tons in the German Customs Union. Their success can be judged by the fact that in 1898 the export of pig iron to the whole of Europe amounted to about 170,000 tons, while the American production of that year was about 11,750,000 tons. But the export of Alabama pig iron is only possible at an advantageous freight when the steamer can also load cotton; otherwise the freight is too high. The financial result of these exports does not yet appear in any dividends of the principal Alabama producer.

Under the conditions heretofore noted it is not necessary for German iron masters to take measures against American competition in their home market. But it is quite otherwise with the competition between American and German iron manufacturers in the markets of other countries, where the Americans are about to expel every other nation. And on account of this competition in neutral markets the German iron masters intend to form export unions and to pay a certain amount as a premium on every ton of iron and steel exported.

The selling prices per ton in the two countries are now as follows:

	Pittsburg.	Essen, Germany.
No. 1 foundry iron	$11.50	$16.50
Bessemer iron	11.15	16.50
Gray forge iron	10 00	12.50
Billets	17.50	20.00
Sheet bars	18.00	26.00
Rails	20.00	28.00
Beams	26.00	27.00
Steel ties	— —	26.00
Plates	28.00	35 50
Sheets	39 00	37.50
Rods	23 00	35 00
Furnace coke	1.60 (at oven)	3.50

An article in the *Kölnische Volkszeitung*, the well-known German paper, has the following on "American Competition in Iron:" "It is said in the annual report of the Dusseldorfer Bourse, that the conditions of the iron market in neighboring Belgium, and partially also in England, are such that they ought to show marked improvement. American competition also increases. By reason of the Spanish-American war the latter did not appear in the expected measure. As a result of the war the American nation was very busy with itself. Vessel room was scarce and dear. At the close of the war there was a great increase of consumption in the American home market. But this increased consumption was easily covered by the enormously increased capacity of the American iron works, with an annual output of about 12,000,000 tons and therefore the expected advance in prices did not come. Undoubtedly the conditions of production in the United States have improved in such a manner that we have to count on a further increase of their competition, not only in pig iron and half-finished goods, but also in finished material, rods and pipes. If it be said on the other hand that we need not fear American competition so long as America is able to consume her own iron output, that is simply begging the question; for the talk of 'threatened American competition' only concerns conditions under which that country is no more able to consume its whole output. That this is already the case appears in the position the German Pipe Manufacturers' Association has been compelled to take by the American manufacturers, the Association being forced to make such a sharp cut in price that its works have only a small or almost no profit. We cannot understand how any one can say in the face of such facts that the offers which American works made in Europe were in the main only *pro forma* offers, for the purpose of learning the conditions under which the European market could be opened for American products.

"Further, there is an effort to depreciate the quality of the American products. It is said that if the Americans, with their production on a large scale, are able to deliver cheaper, the difference in price will be quite equalized by the great quantity of rejected material, which is inevitable under the strict conditions of delivery for rails, for example, which are maintained by the railroads of the German States and by the private railroads also, compared with the rejections of the more carefully manufactured German goods. Besides, the Americans would not be able to store in Germany the refusals, on account of the high expense, nor to sell them to advantage to less exacting purchasers. But it is entirely overlooked, in this view, that the production on a large scale, of American rails, must reduce, at length, the price of the German rails, even if not a single ton of American rails is exported to Germany. And when the Americans, as is, indeed, already the fact, conquer for themselves more and more of the world's market, they will compel the other rail manufacturers to restrict themselves to their home markets. The native country will not always be able to offer the German rail mills sufficient occupation and if they would again seek the world's market, they will find there the Yankee, with a look of triumph on his face and on his lips the words, 'Too late!'"

On the other hand, the *Frankfurter Zeitung* quotes a manufacturer who "counts as one of the most prominent in the Rhenish-Westphalian industrial district," and who is of the opinion that there should be no underestimating the American competition, as is done so often. "The American rolling mills, with their extensive establishments and their great division of labor, both of which permit of cheaper production, are very dangerous competitors of the German works. And those of our home establisbments that do not wish to be beaten by America are sending over to that country their engineers, to inform them of all important improvements the American works adopt. It is important for Germany to be always on the lookout in regard to America.

"The trade papers agree in the statement that at present in all branches of the American iron industry heavy production, increasing from month to month, is already in appearance—a fact which is unquestionable, and the cause of which lies in the small manufacturing expense attained through large outputs. In 1880 the United States took more than 700,000 tons of iron from Europe, but since 1894 almost none. In 1895 she exported 27,000 tons; in 1897, 171,000 tons, and for 1898 the export will be much larger.

"According to the *Centralblatt Deutscher Welzwerke* 'the export from the United States of finished iron and steel in the first nine months of 1898 represented the equivalent of 800,000 tons of pig iron, and one American company alone expects to ship in the future 60,000 tons of steel per month to Europe and Asia.' If one, in spite of all this, regards the further future rosy, he must be one who tries to convince himself that the world's requirements will grow even faster than the world's production."

The annual report of the Westfalische Drathwerke at Langendreer regards the past year as one of the most unfavorable for the German wire trade. At the beginning of the year prices had been so low, partly in consequence of American competition, that profits could not be thought of on such sales. It stated further that American works could buy pig iron and billets $5 a ton cheaper than the price to German works. It added that America had also cheaper coal.

The Hamburg forwarding-office of Anton Guenther says in a circular: "The traffic between North America and Hamburg increases in remarkable dimensions, and if you study my ship-list you will find that the number of steamers which freight in American cotton ports has increased considerably and will increase still more. The cause of these conditions is to be found in the fact that besides cotton seed meal, which always gravitated toward Hamburg rather than to Bremen, great quantities of heavy merchandise are shipped from America

to German ports, especially pig iron. And this must be shipped to Hamburg on account of transmission on the river Elbe."

In connection with these utterances an article in another German paper, concerning the "Situation of the Upper Silesian Mining Industry," is worthy of mention. It says: "Even from Austria we have had lately continual inquiry for pig iron. But the offers for our product were not accepted on account of the cheapness of Alabama pig iron, which was offered uncustomed for 58 marks ($14) a ton free of freight on the Austrian frontier, and therefore was 6 marks ($1.50) cheaper than Upper Silesian pig iron can be delivered at present. This is a remarkable sign of the earnestness of the American competition, which makes itself felt even in a time of favorable markets The business in wrought iron pipes was pretty lively, although the ordinary experience is that the months of December and January are weakest. The difficult situation in the gas pipe market did not change, for the American product, shipped via Stettin by the route of the river Oder, can be sold cheaper than the home product, even in Silesia."

Marion Steam Shovel Co's. Plant.

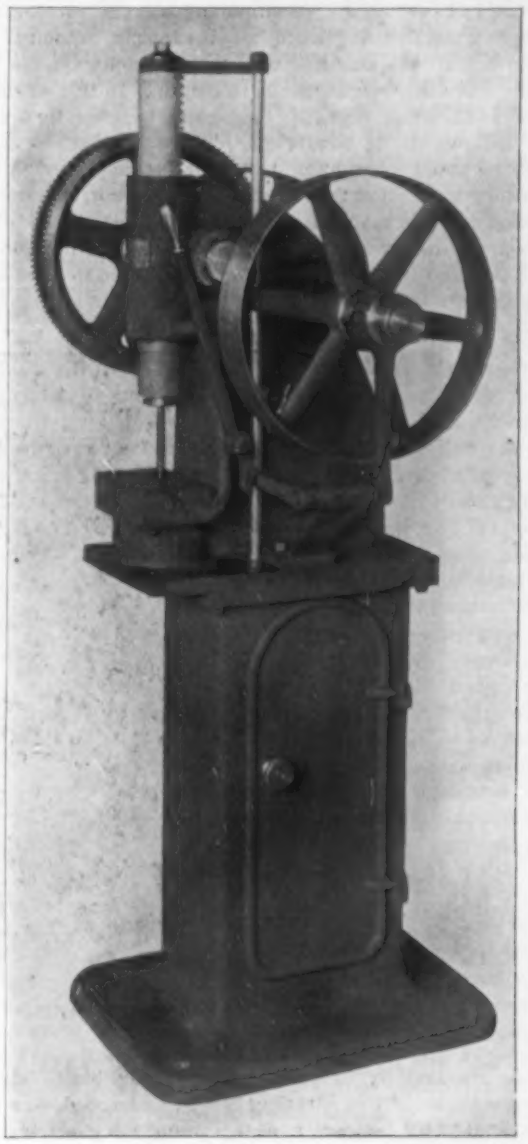
The Marion Steam Shovel Co., of Marion, O., manufacturer of the well known Barnhart steam shovel, which has made some good records on the Lake Superior iron ranges, has a large and well equipped plant and a force of 240 men is kept busy on full time. The works turn out one shovel complete every three days, and from start to finish about 60 days are required for the operations involved in making a shovel. The completeness of the labor-saving equipment provided in these shops is a conspicuous feature. Electricity and compressed air are utilized to the largest extent. The company manufactures its own air compressors and air hoists, and in addition to electrically driven cranes it has electrically driven tools, in many cases single tools having their individual motors. All riveting is done by pneumatic riveters of the company's own design and manufacture. The wheels, axles and trucks used in the Barnhart shovel are manufactured by the makers, as are also the engines that drive it or furnish power for its various motions It is as near an approach to a "self-contained" establishment as is often seen. Nuts, bolts and chains have their departments. All chains are hand-forged. Among interesting tools in the pattern shop is a gear-tooth cutter for automatically cutting teeth in gear patterns. Work on such patterns, which formerly required a week by hand labor, is now done in four hours. Something of the extent of the works and of the provision for handling materials and product between departments may be gathered from the statement that there are nearly 20 miles of tracks in the company's yards. Every finished machine is thoroughly tested before going from the works and every part is tested as the work progresses.

UNFORTUNATELY for the lake vessel owner, his business in ore for the coming year has been nearly all closed up on a basis of 60 cents per ton lake freight from the head of Lake Superior to Ohio ports, which was the rate of 1898. He covered too early. Some of the ore was taken at 55 cents on contracts running to Sept. 1. Now the vessel owner finds shipyards fully engaged until next fall and all of them figuring on new vessels that are not to come out until the spring of 1900. Such are the prosperous conditions on the lakes in sympathy with all other lines of commerce and industry.—[Marine Review.

A PITTSBURG special to the New York *Commercial* says: "The bank started by the Carnegie Steel Co. two years ago to encourage its employes to save their money has proved such a success that it has attracted national interest. More than $1,000,000 is held in trust for employes. None but those on the pay-roll of the company may deposit their money, and 6 per cent is paid for all the money thus deposited. No one can deposit more than $2,000. The bank also makes provisions to loan money to employes who wish to build homes. Many houses have been built in Homestead, Braddock and Duquesne in this manner. Each depositor can withdraw his or her money by giving ten days' notice. The bank is located in the Carnegie Building, Pittsburg. Branch offices are maintained at all the works."

IMPROVED BROACHING MACHINE.

An automatic broaching machine, designed by the W. P. Davis Machine Co , of Rochester, N. Y., is shown in the illustration. The driving pulleys of the machine are fitted with clutches, which are operated by a trip, so that the ram travels down any distance desired. When the trip is sprung, the clutch is thrown over, reversing the direction of the ram, which travels to the top and stops; but by throwing the lever over, the ram will work continuously. The full stroke of the ram is 10 inches, and the machine is adapted for small broaching, key-seating, etc. Weight, 1,100 pounds. The machine is



furnished complete with countershaft. The drive pulleys travel in opposite direction, and the machine has a quick return.

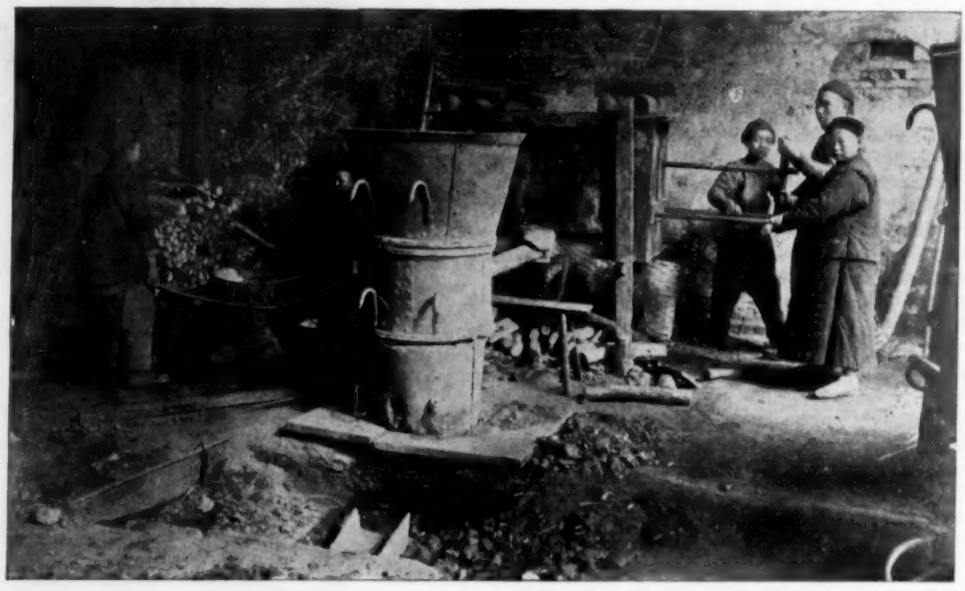
Fewer Triple Expansion Engines.

A few years ago a quadruple expansion engine was built for the Warren (R. I.) mills. When the plant was destroyed by fire a second four-cylinder engine was not ordered. The Narragansett Electric Lighting Co. tried triple expansion engines, and big triple expansion engines were built in Providence for mills in Fall River and New Bedford. Now the tendency is to use two cylinder machines only for mill and electric service, and this conveys the idea that practice and theory do not always agree, and the prevailing opinion is that the average steam user finds two cylinders more economical than three or four. The reasons for the practical abandonment of triple expansion engines for factory work were presented by Mr. George I. Rockwood, designer of the Grosvenordale Co.'s engine—which made a wonderful record for economy—at a recent meeting of the mechanical engineers of Providence. If higher pressures, he stated, are to be used with the object of improving the economy of the engine, the only way to do it, according to the received theory, is to add another cylinder in series.—[Providence Journal.

A CHINESE IRON FOUNDRY.

The illustration below will aid to an understanding of some of the mysteries of the typical Chinese iron foundry, as they are unveiled in the following from a recent issue of the *Celestial Empire*. The foundry of which we show an interior view differs from the other, however, in that a ladle, borne by two coolies, is brought to the cupola. The latter, it will be seen, is quite adaptable to being carried off bodily, in sections at least, whenever occasion demands:

"At Huangkiao we witnessed the operations of a Chinese iron foundry. The furnace was very simple in construction, being made of clay in three sections. The lowermost was what might be called the crucible, and was the receptacle for the molten metal, being about a cubic foot in capacity. The middle section was a ring of the same diameter as the lower section, and about eight inches in height. In this was a hole to receive the blast pipe, the blast being supplied by a native 'box' bellows of the usual type. The upper section was another ring about a foot high. I was not fortunate enough to see the putting together of the furnace; when I saw it, the operation was begun, and a man was piling on the last of the charge —scrap cast iron and coke. One man was then pumping the blast; I waited till I saw the yellow flame begin to show above the piled up iron, which gradually sank down as that below melted. By and by two men pumped the blast. As the process went on, a still stronger blast was needed, so a third man helped at the bellows, and the pumping grew fast and furious, while one workman, wearing an old broad-brimmed straw hat to protect his head and face from the shower of sparks, stirred the glowing mass with an iron rod. In due time the melting was finished, the molten iron having fallen through to the bottom section of the furnace. The blast was stopped, the bellows disconnected, and the upper and middle sections of the furnace taken off and laid aside. The surface of the molten iron being skimmed of its slag, it was well covered with rice husk ashes. This protected the face of the man who next had to handle it from the intense heat that would otherwise have radiated from the molten iron. This man's duty was to clasp the crucible in his arms, literally hugging it to himself, and to fill the molds previously arranged around. In this he was assisted by a woman, who raked back the ashes where the iron was to run out. On this occasion plowshares were the result of the operation, the one charge being sufficient to cast about 20. Almost immediately following this man was another, who took the molds apart and removed their contents. No sooner were the molds empty, than the workmen set about repairing their inner surface with a black paste ready for another casting. Upon inquiry I was told that about 50 catties of iron and 20 catties of fuel constituted one charge for the furnace, and that four meltings were effected in a day's work."



A CHINESE IRON FOUNDRY.

ENGINEERING AND SUPREMACY IN IRON.

The following from the London *Engineer* omits to give due recognition to unparalleled low costs in iron ore and coal mining and transportation, and to the vast reserves of accessible ore and fuel, as elements in the supremacy of the United States in iron and steel manufacture. The adoption by English iron masters of all the economizing machinery referred to, and the expenditure of large sums in doing this, would not compensate for the lack of natural advantages, though they would help to narrow the gap between English and American cost sheets. The question immediately pertinent is whether the owners of English works will be persuaded in time to make the required expenditure. We have noticed some skeptical references by some of them to the large outlays by American works for labor-saving machinery:

"Upon all sides recommendations are heard in favor of the freer adoption of machinery and plant as the best way of meeting the growing American competition. The latest advice of this order was given by the new president of the South Staffordshire Institute of Iron and Steel Managers in his inaugural address. Mr. Le Neve Foster has had a good deal of valuable experience with some of the best firms in the kingdom, and when he dwells on the subject of iron and steel manufacture he knows what he is talking about. He is evidently of opinion that British iron and steel masters need not fear American competition very much if they will but be willing to spend more money on machinery. He rightly insists with regard to this important point that capital is cheaper than labor, or, in other words, that machinery must take the place of brute force. He even believes that the men themselves will in time come to see that it is to their own ultimate advantage for labor-saving appliances to be employed, and he considers that as our workmen get better educated they will not indeed be content to do work which can be better and more economically done by machinery. Mr. Foster evidently looks forward to an era of machinery, and since that would obviously be beneficial, not only to the iron and steel masters, but to the engineering trades, there are, at least, two good reasons for hoping that his anticipations may prove correct. It is a truism often forgotten that the success of an operation is the economy which can be effected by it; and there is nothing like machinery for effecting economies. It is largely machinery which makes £3 per ton an actual price for hematite steel in the States; and in the president's opinion its manufacture in England at the same price is "entirely a question of capital expenditure and large producing capacities, joined together with the best attainable technical knowledge and skill, as well as a perfect system of detail cost, not only of wages, but dealing with yields, so that the smallest leakage may be detected and rectified at once."

FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on Wednesday evening, Feb. 1. President Wanner occupying the chair. The attendance of members was fair, and there was considerable desultory discussion upon the question of trusts and combinations. The Abram Cox Stove Co., of Philadelphia, was admitted to membership. Secretary Evans read the following report of the executive committee:

"Our last report went into the question of demand for foundry equipment in England, Germany, and other foreign countries. It also touched on the condition of the foundry trade in the United States, to the effect that it would appear that 1899 would be better than the previous year, in other words, the outlook for the future is very bright. The question of the hour seems to be the formation of trusts, combinations or pools in different lines of trade. The papers tell us of the formation of trusts or combinations in the following lines—some forming and others already in existence, while others again have been in existence and failed of their object: Tin plate, steel rails, shovels, wire, ore, soil pipe, cast iron pipe, etc. However, we do not find in the above list that the makers of iron castings have as yet formed any pool; nor do we think it is likely that they will, although it would seem that it would be a good thing if it were possible. But from the fact that there are so many different kinds of castings, it would be an impossibility. Still we hope the time will come when they will get better prices for their product than they are getting to day, on the average. This meeting is called to talk over the matter; not in any way looking toward the formation of a trust, but to try to instil into the minds of the foundrymen that they will never get a higher price unless they ask it. We do not find in the above list that there is any trust or pool among the manufacturers of pig iron fire, brick or foundry supplies and equipment; nor do we think there is any likelihood of it from the present outlook. They are therefore on the same plane as the foundry which makes iron, brass and steel castings. On general principles it is our thought that a trust or pool may work very nicely for a time, but in the end it is a question whether the result will show a profit or a loss."

Mr. George Smyser, of York, opened an informal discussion upon the advisability of raising the price of castings; and the question of combines was taken up, not with the view of forming any combine in the foundry trade, but that every foundryman be urged to adopt the policy of asking higher prices.

Messrs. Harkins, Wanner and Thompson, and several others took part in the discussion, and some members reported that they were getting higher prices and were turning away unremunerative orders. One foundryman from a distance said that the Philadelphia foundries were the lowest-priced establishments in the whole country. President Wanner favored the combine idea, declaring that foundrymen should work together, and that the doctrine of "the survival of the fittest" is monstrous, cruel and savage. The time is ripe for asking better prices, and there is need of a great deal of backbone.

No formal declaration was adopted by the association, the action taken at the January meeting being regarded sufficient. These resolutions were as follows: "That it is the sense of this association that the selling prices of castings are, and have been for some time, much too low to admit of honest and reasonable profits to founders. That this association recommends every foundryman to establish higher prices for castings of all kinds, and that at the next meeting of the association the subject be taken up for general discussion, and that founders not members of the association be invited to attend such meeting and make suggestions as to the best course to take to secure a general advance in prices. That the cooperation of the other foundrymen's associations in the country be invited."

Mr. Davis then read his paper on "The Malleable Iron Industry," being a continuation of a paper read at a previous meeting. It was illustrated with very interesting lantern slides. Secretary Evans afterward showed some lantern slides of a new pulley molding machine. Mr. Davis's paper follows:

Development of the Malleable Iron Industry in the United States.

By 1835 the malleable iron industry had become quite firmly established in this country, as there were known to be in operation at this time five foundries. Three of these, the Boyden and Crockett foundries in Newark and the East Boston foundry in Massachusets have been noticed at length in a previous paper. One of the other foundries, owned by Stell wagon & Bryant, and located at Susquehanna ave. and Germantown road in Philadelphia, was briefly described by Mr. John Dessalet in a letter read before this association at the October meeting. This plant was a small one, employing 10 or 12 molders, and like some of the other earlier foundries was an offshoot of the Boyden foundry, as two of its men came from there. It began operations in 1833 and manufactured mainly carriage hardware, coffee mills and other small articles. According to the customs of the times great secrecy was observed, especially regarding the annealing, and only one laborer, selected for his ignorance, was allowed in the annealing room. Mr. Bryant was the practical man of the concern and carried on many experiments. One attempt to add something to the molten iron resulted in an explosion which cost one man his eyesight. The iron was melted in a small air furnace, which could not have been a very economical fuel as it is stated that flame often showed at the top of the stack, which was 80 feet in height. New Castle coal was imported in considerable quantities and the fire brick (Stourbridge), also, came from England. These works continued about five years when the business was abandoned. Another foundry which has not heretofore been mentioned was started at Oak Hill, Green county, N. Y., by Calvin Adams, in 1833 A branch of this concern was established at Westmoreland, N. Y., in 1850, and was called the Oak Hill Branch Malleable Iron Co. The original works at Oak Hill was continued for a few years when it was moved or sold to parties who formed a coporation at Coxsackie, N. Y., where they continued in business for some time. The Westmoreland foundry was operated for a time as a branch of the Oak Hill works, but after severing its connection with the parent foundry it took the name of the Westmoreland Malleable Iron Co., by which it has since been known. Of the five foundries here mentioned one was destroyed by fire and two others were given up during the troublous times of 1837. Other concerns very quickly sprang up to take their places and the expansion of the malleable iron industry in the decade following was very rapid.

DIFFICULTIES WITH PIG IRON.

Up to the breaking out of the Civil War there were few if any radical changes in the malleable iron industry. With the growth of the country the business had gradually extended and foundry appliances have been enlarged and improved. The pig iron was obtained, as in the early days, from the Salisbury District, Orange county, and the Champlain District in New York State and other furnaces scattered along the Atlantic seaboard from Katahdin, in Maine, to Stickney, in Maryland. About this time there was experienced considerable trouble with the iron, owing to changes occurring in blast furnace practice. The warm blast was coming into use and the natural result was a higher silicon iron, unfitting it in many cases for malleable castings. As technical chemistry was then an unknown science, there was no reliable method of ascertaining in advance whether a lot of iron would answer or not. Some founders met with considerable losses, owing to bad castings, which though annealed soft were still brittle. Naturally they attributed all their troubles to the iron—a habit by the way that is not altogether unknown in the present day. Steps were taken to remedy the trouble and in some cases men were sent to the furnaces disguised as workmen to find out whether the hot blasts were the sole cause of the difficulties, or whether it was due to different ores. One manufacturer sent a man to visit the charcoal furnaces and obtain a sample of pig iron from each. This was sent back to the foundry, melted in a crucible and a trial casting annealed. Such methods as these were expensive and required time before the result could be known. Even then there was no assurance that the next lot of iron from the same furnace would be suitable. Such experiences as these are perhaps worth recording as they serve to illustrate the changed conditions due to technical methods now in

use. At the present time when a founder buys iron he orders it subject to certain chemical specification and he cares very little where it comes from or how it was made. With the outbreak of the Rebellion there arose an increased demand for iron for ordnance work and the output of many of the blast furnaces which had heretofore supplied the malleable iron founders was absorbed by the United States Government. Fortunately the Lake Superior region had been developed, and as pig iron from this district was found to be admirably suited for malleable work its use rapidly extended. The first Lake Superior iron was brought into this locality about 1862. The source of supply of charcoal malleable is still from the lake regions.

One salient feature of the malleable iron industry is the great amount of experimental work done in attempting to improve the process. From the time Seth Boyden began his elaborate series of experiments down to the present day, neither time nor money has been spared in putting into operation new methods. Most of these efforts have been directed toward improving the annealing. Of course we always have had and probably always will have with us the man with the mysterious substance, or "flux," which was to be added to the cupola charge, or molten iron, and which was to produce malleable iron direct without any subsequent annealing. These metallurgical operations were usually accompanied by some financial operation on the foundryman's bank account and this being accomplished, the man with the flux usually departed just before the heat was to be poured, to be seen no more.

THE ANDREWS PROCESS OF ANNEALING.

One attempt to introduce a new method of annealing, which was known as the Andrews process, was made at a number of plants about 1875. The process consisted in passing water gas, which is composed of carbon dioxide, carbon monoxide and hydrogen, over the castings heated to redness. The water gas was generated by passing steam through red-hot charcoal in a retort contained in the large retort in which the annealing boxes were placed. Both the retort for generating the gas and that containing the castings were heated from the same source. The plant consisted practically of a small water gas plant inside of a retort or annealing oven. Suitable connections of course were provided for passing the gas over the castings and providing for its escape. The process could be made to work fairly well but the mechanical difficulties of keeping the gas pipes, which were subjected to high temperatures, in good order were very great. Under the conditions under which the Andrews process was installed the proportion of carbon dioxide was probably too large; considerable steam was passing through the charcoal, and these two chemical reasons, with the mechanical difficulties mentioned above, caused the abandonment of the process. The reaction on which the decarbonizing process probably depended was the oxidizing action of carbon dioxide. This gas by itself is so active that both iron and graphite will be attacked; in other words, a scaly casting will result. Provided the carbon dioxide be diluted sufficiently, it still is able to oxidize the carbon, but will not attack the iron. At the time the process was introduced the idea was held that the hydrogen combined with the carbon to form some volatile hydro-carbon. These two elements do not unite directly except at the temperature of the electric arc, when acetylene is formed [Richter's Organic Chem., p 153]. In this case, as we are dealing with the ordinary temperature of the annealing retort, less than 1,000 degrees C. it is highly improbable that this reaction could have taken place. Experiments with the Andrews process were carried out at the works of the Westmoreland Malleable Iron Co. Mr. F. M. Metcalf, treasurer of this company, has communicated to the writer his experience with this process. His account of the experiments, which extended over several years, is quite interesting and I quote his letter, merely omitting some of the names.

WESTMORELAND, ONEIDA CO., N. Y., Jan. 26, 1899.

Mr. Geo. C. Davis.

DEAR SIR:—Replying to your inquiry of the 25th: The water in the Andrews process of annealing was dripped into a funnel and ran through a pipe with a trap or bend in the pipe, down through the top of the retort into an oval casting called the heater, which was at the top of the retort just above the box of red-hot charcoal which served as a water gas generator. Both received their heat in the same way through the brick of the retort. This was supposed to be sufficient to reduce the water to steam and to some extent to superheat it, though Andrews did not favor superheating much. Steam passed from the heater into the top of the front of the charcoalbox, which was as full of charcoal as practical and supposed all to be red-hot, the same as the annealing boxes and contents when under heat. The steam having no other outlet, and the charcoal box being steam- and gas-tight, it passed down through the hot charcoal and out at the bottom back end of the charcoal box into a pipe leading under and by latch connections into the annealing boxes. In passing through the hot charcoal it was theoretically converted into hydrogen and carbon monoxide. Over the opening in the charcoal box, where the gas made its exit, was an iron basket to protect the outlet from getting full of charcoal. There was very little pressure, as there was nothing but a six- or eight-inch column of water in the trap to prevent the steam backing out, and I think we had no check valves. I think I suggested higher pressure and hotter steam to Andrews but he did not favor the steam being very dry, as I think he had tried superheated steam. I have given you rough sketches to show you as well as I can with the short time at my disposal. The original charcoal box was rectangular and, say, about five feet long. It was charged with charcoal through a luted door at the end and filled as full as possible, always fullest at the back, and after running a day or two was of course exhausted to a considerable extent. This reduced the depth of hot charcoal through which the steam was obliged to pass to so shallow a mass that it was thought that at that point the steam was not effectually converted, and to that we attributed the scaling to which I referred in my last letter. As Andrews was about to build another such furnace in Newark and intended to change the shape of the charcoal box to remove this difficulty, we discontinued using the process and awaited the result of the change. An upright cylinder was made for the Newark furnace, the idea being merely to keep it nearly full at all times, as was more easily done in an upright box, at least as high up as it got heat, and thus ensure a uniform and sufficient depth of charcoal thoroughly to convert the steam into gas of the right kind.

This effort failed, as you say, and it was thought by Andrews that the diameter of the charcoal box was too great, so that the charcoal did not get heated all through, thus allowing steam to pass that did not get converted. We then did not open up on it again; but about two years later, upon the introduction of brick packing into the charge of castings in a furnace that had been built in New Haven, we started in again and used this method for some months with fair but not entirely satisfactory results. To improve results we then made a new charcoal box of a bottle shape and heated it to as high a point from the bottom as was practicable and hoped, by thus passing the steam through as great a depth of hot coal as possible, to be successful in getting rid of the carbon dioxide and unconverted steam that caused the scaling which always appeared to a greater or less extent in some part of the charge of the iron, usually at the bottom where the gas first entered. This failing, we introduced a con enser and then passed the supposed converted gas through it to take out any unconverted steam before passing the gas into the annealing pots. This failed, and then the whole oven failed and began to disintegrate to such an extent that we did not continue the effort. We have heard of gas annealing ovens that were claimed to be successful, though we could never place them exactly. If you know of any we would be glad to hear of them, as we have always thought that there ought to be some successful way to improve the process by annealing with gas, but we have not "hankered" ourselves after any more experimenting in that line at such expense as we did the above.

As we understand it, the process was first used by —— at —— —, where we went to see it. We thought we saw it as it was and became victim No. 2. Ballard & Minchin, of Newark, were No. 3. I went to see their success on the third round of the furnace, by Andrews' desire, but he had just completed what I was convinced was the third failure when I arrived and I never learned whether Ballard survived the great anger under which he was suffering on my arrival or not. Meanwhile, Andrews had just received a letter from the ——

people saying that they were still using it right along with "charming results." Andrews, Minchin and myself went to see those charming results and found they were worse than our worst. Shortly after that ——— discontinued using the process, and I think the next furnace was built in ——— shop in ——— for making steel from malleable iron by re-carbonizing and also by arresting the decarbonizing process at the steel point. The ——— company were the fourth victims, and we followed on as the fifth, as above stated.

At this distance of time my sensitive feelings will not be hurt by any reference that you may wish to make to the process and our connection with it, and we certainly have no objections to your so referring to such extent as you wish. We hope no one will think, however, that we have not learned to experiment more conservatively than we did then, though we are always open to improvements. I have answered you at much greater length than I intended, and hope if you get tired reading the effusion you will be compensated fairly by laughing at the victims, as I have learned to do. Yours truly,

F. M. METCALF, Treasurer.

EXTENT OF THE MALLEABLE CASTINGS INDUSTRY.

The malleable iron industry has undoubtedly been developed to agreater extent in the United States than in any other country. Mr. R. A. Hadfield [Journal B. I. & S. I., Vol. 1, 1897, page 180] says, in his discussion of a paper by Mr. G. P. Royston on malleable iron: "The author's paper is especially valuable, too, as calling attention to a line of work to which we in the United Kingdom have not paid sufficient attention; that is, the production of malleable iron castings, for in America that industry is carried on on a very large scale. Its production has been so thoroughly specialized that I question whether we could touch either the price or quality which are being obtained in the United States. A large user in Sheffield has told me that he had to send for execution in America very considerable requirements, the price of casting being exceedingly low, the quality excellent, and the time of delivery short as compared with English makers."

Mr. Hadfield's remarks were made nearly two years ago, but the conditions he mentions are probably the same now as they were then. At present there are in this country about 90 malleable iron foundries [Directory Iron and Steel Works of the United States], varying in capacity from 1 ton to 80 tons a day. Nearly all of them are located north of the Ohio and east of the Mississippi. They are quite evenly distributed over that region, though of the New England States Maine and Vermont have none. In the Southern States there is only one and in the entire West, from the Mississippi to the Pacific Slope, not a single malleable iron foundry exists. By far the heaviest tonnage goes into car castings and farm implements. Since malleable castings are sold so low they have, to a considerable extent, replaced gray iron castings in many purposes, especially in car building. Broadly speaking, the founders in the Central West are mainly devoted to the heavier castings, while the Eastern foundries manufacture a very large variety of small articles, such as carriage and harness hardware, pipe fittings, bicycle fittings, ship hardware, parts of textile machinery, typewriters, gun locks, pistol frames, and, to use a somewhat hackneyed phrase, "other articles too numerous to mention."

There are at present at least five coke blast furnaces that produce largely malleable pig. Two of these are in New York State and one each in Pennsylvania, Illinois and Tennessee. So the source of supply is not centralized. The coke malleable differs from the charcoal in being a trifle higher in sulphur and considerably higher in manganese. The difference in sulphur is not great enough to be of any importance where the iron is to be melted in the air furnace, as most of it is for malleable purposes, while the high manganese renders coke iron desirable for mixing with charcoal irons which are, as a rule, too low in this element. Coke malleable has now been in use for about 15 years and its consumption is undoubtedly increasing. It was thought at one time that some of the numerous steel casting processes would replace malleable iron. By steel I mean the product of the open hearth or modified Bessemer, and not any of the numerous semi-steels. In the heavier classes of the work this has to some extent proved true; but as a rule the two processes are developing along two different lines. The difficulties of preparing small molds to withstand the high temperature of the steels and the more costly plant necessary for its production will probably prevent its use for small or intricate castings.

In closing, the writer wishes to acknowledge his indebtedness to Mr. Stanley G. Flagg and Mr. John Dessalet, of Philadelphia, and Mr. F. M. Metcalf, of Westmoreland, N. Y.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The furnace at Ironton, O., known as "Big Ætna" has been purchased by the Marting Iron & Steel Co. for $90,000. The new company is headed by Col. H. A. Marting and is capitalized at $200,000. The other incorporators are J. D. Foster, A. H. Mittendorf, C. H. Ketter, A. R. Johnson and E. J. Bird, Jr. The work of preparing the furnace for blast will begin at once. It will cost probably $35,000 to do this and the work will require 60 days. The work of improvement was begun three years ago, but was stopped after $35,000 had been spent. Three Whitwell stoves stand uncompleted and will be finished. The stack is to be relined also. The blowing equipment is sufficient

The *Railroad Gazette* has advices that the West Virginia & Pittsburg will buy the following machinery for the new shops at Weston, W. Va.: One driving wheel lathe to take wheels 72 in. on tread, with double quartering attachments, complete; one double axle lathe, 12-ft. bed, taking 8 ft. between center, complete; one 32-in. engine lathe, 12-ft. bed, taking 7 ft. between centers, together with chuck for lathe; one 32 x 32-in. single-head planer, 14-ft. table; one bolt cutter, capable of cutting threads on bolts from ¼ in. to 1¾ in.; one slotting machine, 10 in. stroke; one drill grinder, to grind both flat and twist drills from $\frac{1}{16}$ in. to 2¼ in.; double emery grinding machine, complete, 18 x 3 in., 1¼-in. hole for shaft; one 42 in. car wheel borer, with automatic attachment for facing hubs; one hydraulic wheel press, space between bars 78 in. for 72 in. wheels; length of bars 13 ft. 6 in., double pumps, belt-driven; one air compressor; one set 60 in. wrought iron rolls, capable of bending plates up to ¼ in.; combination punch and shears to punch up to 1 in.; throat in shears and punch 18 in.; one 1,500 lbs. steam hammer; one patent car mortising and boring machine, with graduated stroke, automatic chisel reverser and auxiliary boring attachment; one heavy car sill and timber dressing machine, capacity ⅜ in. to 12 in. in thickness by 30 in. wide; one 15-in. swing cut-off saw; one 20-in. rip saw, with iron table; one patent band sawing machine, capacity 15 in.; one 24-in. swing pattern maker's lathe; one Concord buzz planer, 7-ft. table, works 30 in. wide, 12 in. thick.

Olsen & Holen, of Argyle, Minn., dealers in farm implements and merchandise, have become incorporated. They will purchase belting, engine, pumps, twist drills, steel castings, boilers, bolts and nuts, brass tubing, chain belting, files.

The Byesville Iron & Steel Co., of Cambridge, O., recently incorporated, will purchase wood pulleys, planers, pipe cutting machinery, pumps, tool steel, dynamo, engine, belting, boiler, engine lathe, cranes, fire brick and clay, motors, chilled and sand rolls.

The Portage Lake Boiler Works have been formed at Hancock, Mich., and will start up about Feb. 15. Tools are being purchased.

The Hood Foundry & Machine Works, of Harmony Grove, Ga., has been incorporated.

New Construction:—

The Harrisburg Foundry & Machine Co., Harisburg, Pa., is building n enatire new plant, the main building of which will be 140 x 300 feet. Some machine tools may be required.

The Weber Gas & Gasoline Engine Co., Kansas City, Mo., intends to build a new plant at once, to consist of foundry, machine shop, pattern shop and office buildings. These buildings will be of improved construction, and will contain up to date appliances for the rapid and economical handling of work.

At Donaldsonville, La., F. H. Allen has begun the erection of a foundry and machine shop.

The Lynchburg (Va.) Hardware Mfg. Co. has been formed and the Norwich Lock Works will be removed to Lynchburg from Roanoke and operated in connection with the Lynchburg Brass Works.

Kieckhefer Bros. Co., Milwaukee, will build an addition 52 x 110 feet and five stories, to its tin and granite ware plant.

The Philadelphia & Reading has just opened bids for large car shops at Schuylkill Haven, Pa.

Messrs. Roydhouse & Arey, Builders' Exchange, Philadelphia, Pa., have plans prepared for the proposed enlargement of the Standard Steel Co.'s plant, at Burnham, Pa. A steel and brick building, 60 x 180 feet in dimensions, will be built. Bids are now being received.

The Co-operative Stove & Foundry Co., Wheeling, W. Va., manufacturer of the Valley Star stove, will enlarge its plant.

President McLaren, of the Addyston Pipe & Steel Co., has been in the Birmingham district, arranging for surveying and engineering work preliminary to laying foundations for the new pipe plant between the Thomas and the Tennessee furnaces. The plans provide for the delivery of iron to the cupolas on a level 33 feet above the base.

The Board of Improvement of Ironton, O., is actively pushing a town lot sale, that is expected to net a profit of $50,000. This will be used by the board to secure several manufacturing industries. Wood-working or iron-working establishments, or a tile or shoe factory preferred.

Fairbanks, Morse & Co., Beloit, Wis., will rebuild their tank department which was burned last summer. Additional buildings going up will furnish accommodations for 300 more men.

New buildings will be erected at Indianapolis for the Home Stove Co., Geo. Alig, proprietor, which is to be removed from Greenfield, Ind.

At Columbus, Ga., an addition 70 x 160 feet and two stories, is being made to Golden's foundry and machine shops.

The Hawley Down Draft Furnace Co., of Ohio, at its meeting at Cincinnati last week discussed a proposition to build a plant at Cincinnati for the manufacture of the furnaces for the Central Western trade.

Power Equipment and Machine Tools.

The Corliss engine furnished two years ago by the Lane & Bodley Co., Cincinnati, for the Newport Rolling Mill Co., Newport, Ky., gave such satisfaction that a much larger one for running a train of sheet rolls is now being installed by the same makers. The new engine is a heavy duty Corliss, and will be geared direct to the rolls. The cylinder is 34 x 72 inches. The bed of the engine is cast in one piece, making a massive casting weighing 50,000 pounds. The fly wheel is unusually large and heavy, measuring 30 feet in diameter and weighing 132,000 pounds in the rough. It was cast in nine sections.

The Brown Hoisting & Conveying Machine Co., of Cleveland, has been awarded a contract by the Navy Department for coal handling machinery for the coaling station at Mare Island Navy Yard, California. This is the sixth coaling station for the United States Navy to be equipped with the Brown company's machinery, and constitutes all the stations so far awarded. The Brown Hoisting & Conveying Machine Co. has also been awarded the contract for a 100-ton steel floating crane for the Brooklyn Navy Yard. This crane will weigh over 1,000 tons.

In addition to the large compound air compressor furnished the United Salt Co. for its Madison st. plant, Cleveland, last year, to pump in a well 2,000 feet deep, the Hall Steam Pump Co., Allegheny, Pa., has just put in operation a similar pump at the Newburg plant of the company, which operates on 85 pounds steam pressure to compress air to 500 pounds pressure. Last week the Hall Steam Pump Co. received an order for two duplex cross compound compressors with 18-inch low pressure cylinders for the Lorain Steel Co. at Johnstown, Pa., and has lately shipped a single straight line machine to the H. E. Teachout Boiler Works, Cleveland, and a duplex pump to the Griffin Car Wheel Works at Detroit.

The Westinghouse Machine Co. is completing for shipment to London five gas engines with a total capacity of 300 horse power. They range from 150 horse power down, and will be sold through the Westinghouse Electric & Machine Co.'s London office. In connection with the organization of the Becker-Brainerd Milling Machine Co., which has acquired the Becker Mfg. Co. at Fitchburg, Mass., and the Brainerd Milling Machine Co., of Hyde Park, Mass., as announced last week, it is given out that the Becker Mfg. Co. will be removed to Hyde Park where the new shop of the Brainerd company, 200 x 90 feet, is going up. The new company will employ 300 men.

Two blowing engines, each weighing 1,100,000 pounds, are being built by the E. P. Allis Co., of Milwaukee, for the Duquesne blast furnaces. They have 50-inch high pressure cylinders; a 96-inch low pressure cylinder; two air cylinders, each 96 inches in diameter; a stroke of 60 inches, and will pump 50,000 cubic feet of air a minute. They will be ready to be set up in two months.

The Dodge Mfg. Co., Mishawaka, Ind., has taken an order for a large iron pulley for the Deering Harvester Works. It will be of the double-spider type, 18 ft. in diameter, with 46-inch wood face, and will weigh 42,000 pounds. It is the third of the kind put in these works by the Dodge company.

It is now announced that the transfer of the Corliss Steam Engine works at Providence, R. I., to a syndicate is a sted toward the formation of a combination including a number of engine builders of the country. It is expected that the Corliss and the Greene & Wheelock works will be running in conjunction at an early date. J. H. Hoadley is quoted thus: "There are 12 concerns which, by combining, can control the engine-making business in this country and, to a large extent, abroad also. Of these, eight have already practically agreed to join, and it therefore does not make very much difference whether the others join or not, but the probability is that every manufactory will come in. The ultimate capital will, of course, depend upon the value of each concern that comes in, but it probably will approximate $25,000,000. Extensive manufacturing works will be constructed either in New York or in New Jersey, but the location has not yet been definitely decided upon. The motive which has prompted the combination of the engine builders is the success of compressed air as a motor power. The president of the new company will be Col. M. Thompson, of Providence. Among directors mentioned are Edwin S. Cramp, Lewis Nixon, W. H. Knight, who is chief of engineers of the American Air Power Co., and Chas. A. Leib, owner of Washington electric railway and lighting plants.

At the annual meeting of the Niles Tool Works, Hamilton, O., last week the old directors were re-elected with the exception of T. F. Gaff, Cincinnati, who resigned and is succeeded by Willis E. Hall.

The Lorain Steel Co., Lorain, O., has ordered four additional legs for the McMyler hoists now being erected at its docks. This will give six legs for each boat and insure greater dispatch. Another whirlie will be added also, giving much increased handling capacity.

At Binghamton, N. Y., action has begun in the Supreme Court to foreclose a mortgage of $75,000 on the Charlotte Iron Works.

The Bullard Machine Tool Co., Bridgeport, Conn., is about to erect an extensive addition.

The J. S. Hill Mfg. Co., Baltimore, has been incorporated for the making of tools and machinery by John F. Harris, John S. Hull, Clarence E. Harris, Edward P. Herpin, Charles E. Hull and Charles H. Knapp. The capital stock is $100,000, divided into 2,000 shares.

The Bethlehem Iron Co. has just finished the largest shaft in the world. It is for the Boston elevated railway and weighs 170,000 pounds. It is 28 feet long and 36 inches in diameter.

The machinists at the F. M. Davis Iron Works, Denver, Col., who struck Oct. 24, 1898, against the discharge of certain employes, have gone back to work. The company grants the minimum rate of 30 cents an hour with price and a half for over time.

A charter has been issued to James C. Potter, John Johnston, Daniel T Brown and James Johnston as the Potter & Johnston Co. The capital stock in the company is $100,000, and the plant will be located at Pawtucket, R. I. James C. Potter was formerly connected with the Potter & Atherton Machine Co., of Pawtucket, and later was manager of the American Machine Co., better known as the Howard & Burlough Machine Co.

The Pittsburg District:—

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburg, has received a contract from the La Belle Steel Co. for a very large double mandrel shear for use in its mill in Allegheny.

A strike is on among the 100 odd riveters at the works of the Pressed Steel Car Co. in Allegheny City, Pa., owing to a

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Harrison Safety Boiler Works, Col. Sta., Philadelphia, Pa.

new ruling that 1,000 rivets constitute a day's work instead of 500 as formerly. Some little trouble has been experienced also in some other departments, but the company is endeavoring to fill the places of the strikers with new men.

William Clifford, Hussey Building, Pittsburg, a mining engineer who has for some years controlled the patents in the United States for the manufacture of the Capell mine fan and has supplied the trade by having the fans made under contract, will erect a plant in Pittsburg or vicinity to manufacture the fans. The plant will consume plates and small structural shapes.

A consolidation has been effected of the Baker Chain & Wagon Iron Mfg. Co., Allegheny, Pa., and the Baker Forge Co., Ellwood City, Pa., the Oliver interests being in control. The product of the plants is used largely by the new Pressed Steel Car Co., in which the Olivers are interested, and there is a rumor that a consolidation may be made with this company.

At a recent meeting in the Park Building, Pittsburg, the stockholders of the Shelby Steel Tube Co. voted to issue $1,000,000 preferred stock, the proceeds of which are to be used in the purchase of outside interests.

The Oliver Iron & Steel Co. is now at work on an order for carriage bolts which will call for 46 freight cars for transportation, and which amounts to 7,000,000 bolts and their accompanying nuts. The varieties included in the order comprise bolts from three-sixteenths to three-fourths of an inch in diameter and from three-fourths of an inch to 12 inches in length.

The stockholders of the Southwest Connellsville Coke Co. (Illinois Steel Co.) at their annual election at Mt. Pleasant, Pa., elected T. H. Hyman vice-president to succeed W. P. Palmer. President C. H. Foote of the coke company, President Eugene Buffington of the Illinois Steel Co., and E Shearson, auditor of the Federal Steel Co., were the Chicago representatives present.

It is reported that Laughlins & Co., Ltd., will erect additional coking plant this year. Plans have been prepared for 500 to 600 bee-hive ovens, but it is not decided whether they will be erected in the Connellsville region or adjoining the Eilza furnace plant, Pittsburg. It was necessary to tear down a block of ovens to make room for the new furnace.

The annual meeting of the American Axe and Tool Co. was held at the office of Hubbard & Co., the Pittsburg branch, on Tuesday of last week. Reports presented showed a favorable condition of business, the export branch of the trade being unusually large. The following officers were elected for the coming year: Charles W. Hubbard, Jr., Pittsburg, president and treasurer; G. Hannay, New York, secretary; Daniel Diven, Mill Hall, Pa., assistant secretary; F. T. Powell, Jamestown, N. Y., first vice-president; C. H. Wier, Baltimore, Md., second vice-president; directors — C. W. Hubbard, Sr., chairman; C. W. Hubbard, Jr., George T. Lane, Troy, N. Y.; F. T. Powell, Jamestown, N. Y.; Ethan Rogers, Balston Spa, N. Y.; G. Hannay, New York; S. A. Rankin, Pittsburg; Charles H. Wier, Baltimore; James H. Mann, Frank E. Mann, Lewistown, Pa.; A. C. Mann and Robert Mann, Mill Hall, Pa.; James H. Lockhart, Pittsburg; Mrs. Helen Knickerbocker, New York; C. W. Mackay, Franklin, Pa.

The Westinghouse Air Brake works at Wilmerding, Pa., is rushed with orders and is working a force of 2,000 men up to 9:20 P. M.

The Beaver Falls, Pa., rod mill of the American Steel & Wire Co., which has been closed down since July, started up this week. It is expected the wire and wire nail mills will follow.

The formation of the Pittsburg Horse Shoe Co. was mentioned in these columns some time ago. The company has most of the machinery already ordered for the plant, and the exact site for the works will be secured in a few days. It will be in the Monongahela valley. The company has a capital stock of $100,000, all subscribed and paid in. The office is at 306 Ferguson Building, Pittsburg. The product will consist of steel horseshoes and iron horseshoes. The steel product will be made from steel bars rolled from billets in the nine-inch mill which the company will erect, while the iron shoes will be made of bars rolled in the same mill from muck iron

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piled with scrap, the latter making a better material for the purpose than the muck bar alone.

The Union Pacific will spend $1,500,000 for new equipment, including 48 freight locomotives and 1,000 steel coal cars.

General Industrial Notes:—

Pine Grove furnace was built in 1828, and since then there has never been a time when they hadn't some pig iron to sell. But that time is no more. Last week, Means, Kyle & Co. sold the last pound of Pine Grove iron in the market. Henceforth Pine Grove metal, to use a publisher's term, "is out of print." —[Ironton, O., *Register*.

Alice Furnace of Pickands, Mather & Co., at Sharpsville, Pa., went out of blast the past week for repairs to the bosh. t will be out about a month.

All the charcoal furnaces in Jackson county, Ohio, are out of blast and only two of them have any possibility of running again—Jefferson at Oak Hill and Madison at Rempel. The former is put on the abandoned list in the last Directory, and marked "likely to be long inactive." Only two furnaces are now running at Jackson, O.—the Fulton and Star—and only four in Jackson county, the other two being the Wellston Iron & Steel Co.'s stacks.

The Amalgamated Association is supporting the strike of Old Meadow Rolling Mill Co. employes at Scottdale, Pa., giving each man $4 a week. Subordinate lodges contribute in addition.

The Illinois Steel Co. has issued notice that it intends to retire May 3 next the whole of a series of 62,000 bonds, aggregating $6,200,000, dated Jan. 1, 1890, and bearing 5 per cent interest. These bonds mature in 1910, but are payable at any time before that date upon condition that the company gives 60 days' notice and pays a premium of $50 on each bond.

The Watts steel and iron syndicate of Middlesborough, Ky., has obtained complete control of the Ducktown ore field and the furnaces will be run to their full capacity of 300 tons per day.

The Pennsylvania Steel Co., Steelton, Pa., has received an order for a large lot of street railway supplies for shipment to France.

At the annual meeting of the stockholders and directors of the Dillon-Griswold Wire Co., Sterling, Ill., Moses Dillon, J. Wool Griswold, Seymore Van Sanvoort, W. H. Shields and W. M. Dillon were elected directors. W. M. Dillon was elected president and treasurer; Mr. Griswold, vice-president; Mr. Shields, secretary.

The Columbia (Pa.) Iron Co. has re-elected C. C. Kauffman president and general manager and J. W. Yocum secretary and treasurer.

The Stewart Iron Co. has contracted for a new blowing engine for its blast furnace at Sharon, Pa. A skip hoist for the furnace is also under consideration.

At Birmingham, Ala., the United States Circuit Court has issued a decree ordering the sale, Feb. 24, of the properties of the Alabama Iron & Steel Co. They consist of a charcoal iron furnace, a large stock of pig iron, rolling mill and foundry and an immense tract of coal lands in the Montevallo coal region. The bondholders will buy the property.

It is reported that the Cooper & Hewitt furnace and ore property at Riegelsville, Bucks county, Pa., idle since 1892, will resume April 1. Repairs to the stack are being made.

The tin plate plant at Atlanta, Ind., has started up after being idle three weeks.

The 6,000 or 7,000 Cambria Steel Co. employes have been given an advance in wages—practically a restoration of the former wages. In some instances the increase is 10 per cent and in others 25 per cent. The general average advance is 10 per cent. The order went into effect on Feb. 1.

The Standard Radiator Co., of Buffalo, N. Y., has sold its plant and business to the American Radiator Co.

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The Bethlehem Iron Co. sent 318 tons of armor plate for the battleship Alabama to Cramps' shipyard last week.

The Janesville (Wis.) Barb Wire Works, which are outside the American Steel & Wire Co., are running night and day and are quite behind orders.

The Inter-State Malleable Iron & Machine Works, West Duluth, Minn., have started on night work. About 90 men are employed. One order recently received will require seven tons of malleables a day for nearly a year.

It is expected that the coming dividend on the preferred stock of the Federal Steel Co. will be paid in April.

Ex-Congressman F. G. Niedringhaus, of St. Louis, who has been elected president of the newly organized National Enameling & Stamping Co., announces that the capacity of the works at Granite City will be doubled. He will go to New York to manage the new company.

The strike of molders at the Ames Iron Works, Oswego, N. Y., has been settled after four weeks.

At the annual meeting of the directors of the Brier Hill Iron & Coal Co. at Youngstown, O., the following officers were elected: George Tod, president; Henry Tod, vice-president; Henry H. Stambaugh, secretary and treasurer, and J. G. Butler, general manager. These and Wm. Tod make up the board of directors.

FRANK R. BLAUROCK has been appointed Western sales agent of the Braeburn Steel Co., of Pittsburg, manufacturers of fine crucible tool steel, open-hearth spring and machinery steel and steel forgings. Mr. Blaurock's office will be located at 179 Lake st., Chicago.

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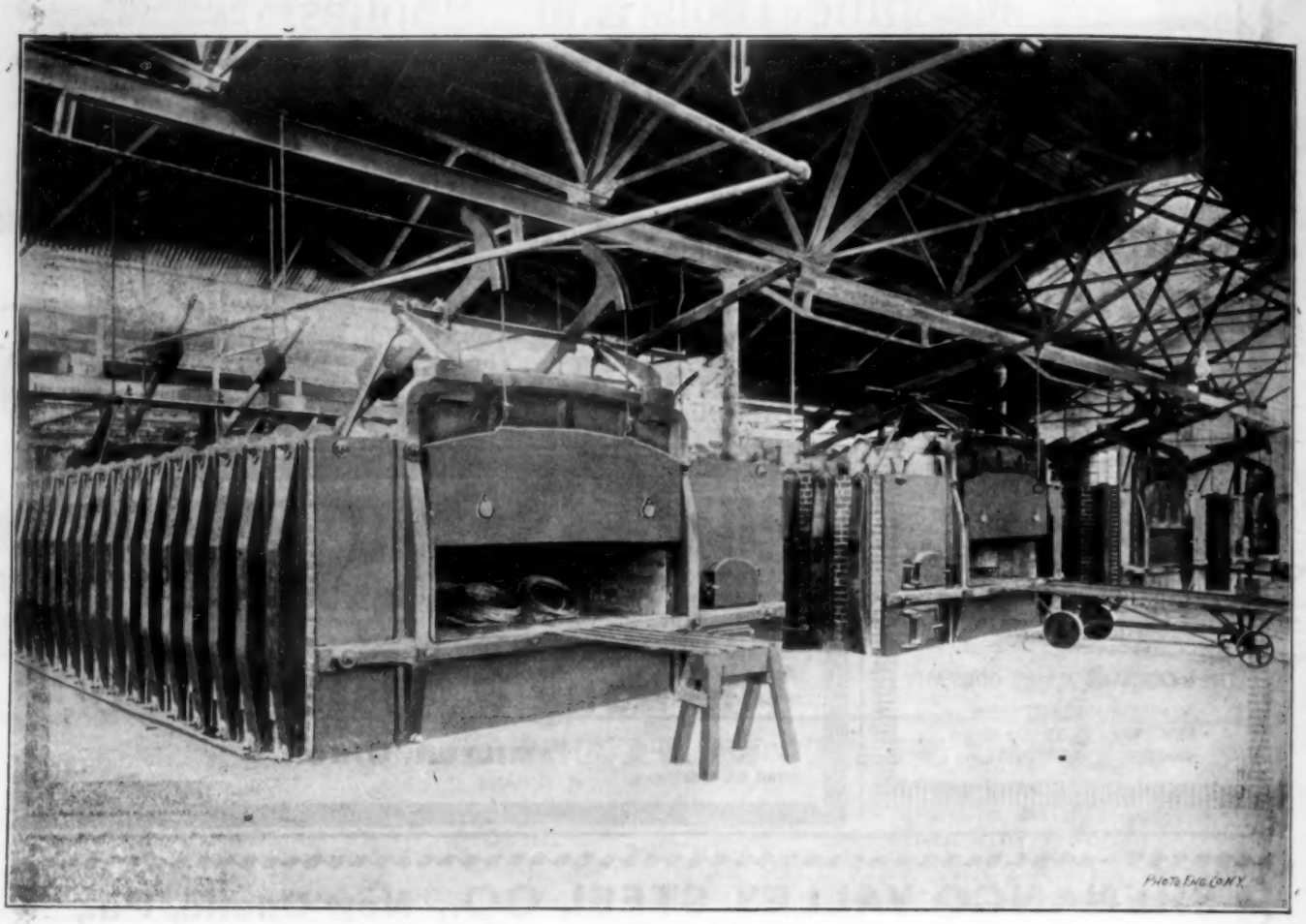

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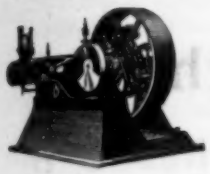

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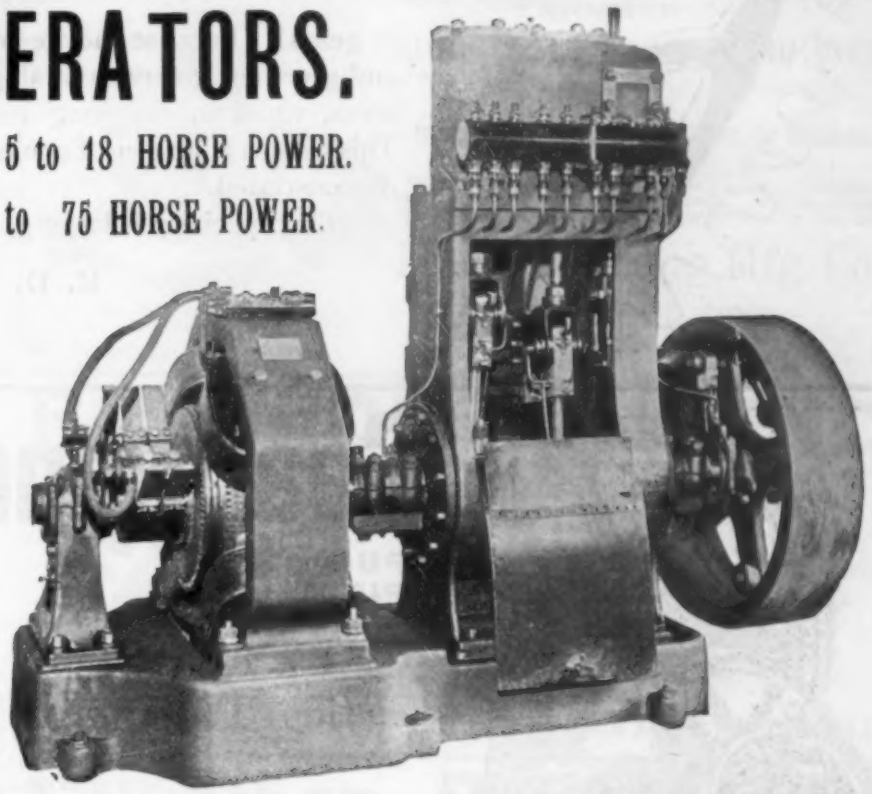

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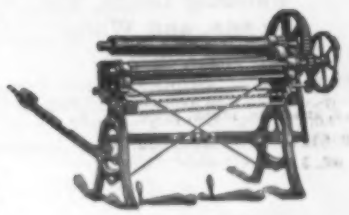

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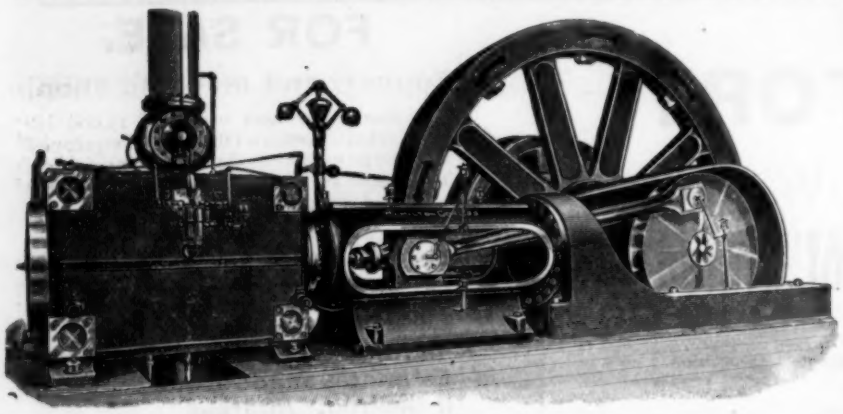

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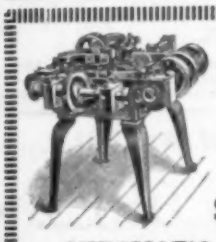

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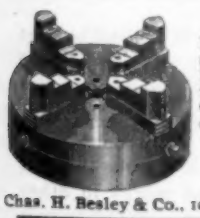

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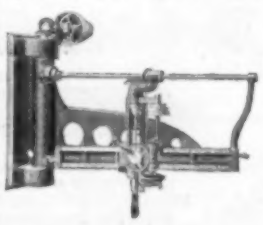

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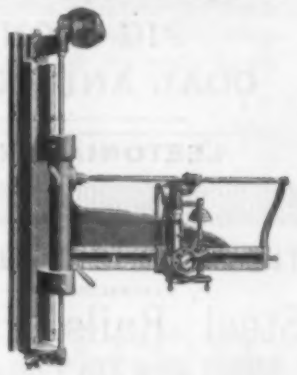

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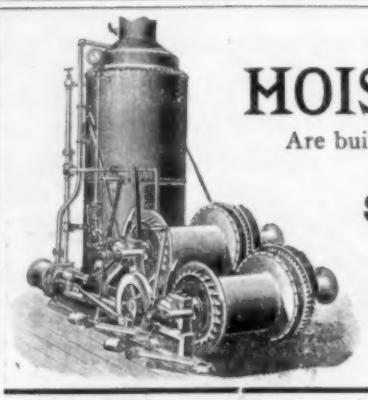

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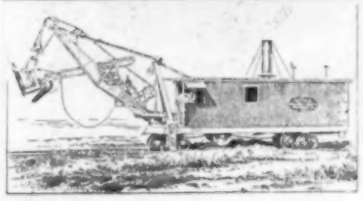

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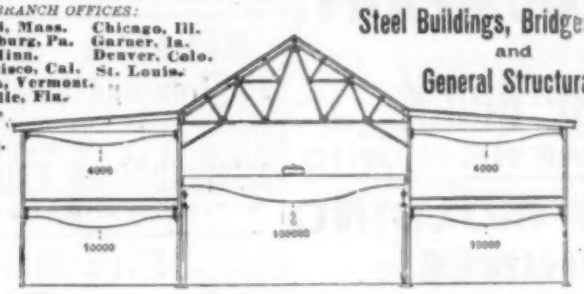

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EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

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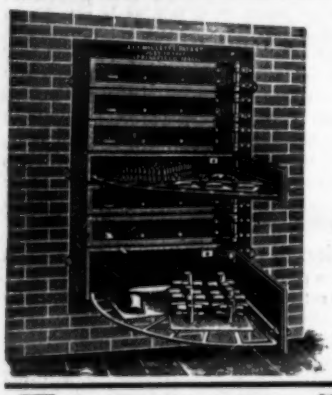

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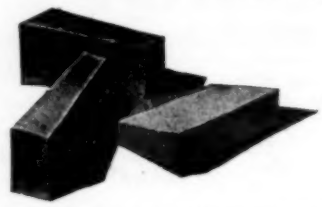

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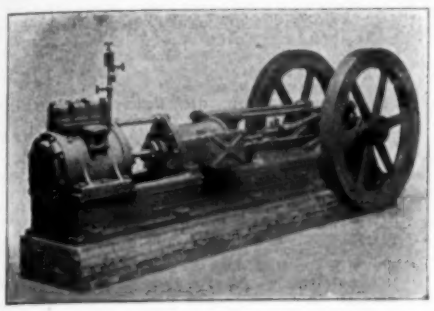

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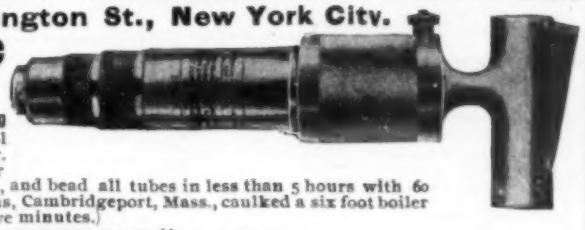

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Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
The Hanson & Van Winkle Co., Newark, Chicago, New York.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.
Vitrified Wheel Co., Westfield, Mass.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
The Hanson & Van Winkle Co., Newark, Chicago, New York
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.

Engineers and Contractors—
Wellman Seaver Engineering Co., Cleveland.
Heyl & Patterson, Pittsburg, Pa
Meehan Boiler & Construction Co., Lowellville Ohio.
E. E. Erickson, Pittsburg, Pa.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.

Engine Packing—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Engine Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington & Son Co., Philadelphia

Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
Geo. B. Sennett Co., Youngstown, O.
The Aultman Co., Canton, O.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.
Eclipse Electrotype & Eng. Co., Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland, Pa
Diamond Fire Brick Works, Akron, O
F. B. Stevens, Detroit, Mich.
The S. Obermayer Co., Cincinnati, O
Chicago Fire Clay Product Co. Chicago Ill
Columbia Fire Clay Co., Cleveland, O
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flexible Shafts—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Fluor Spar
James Irwin & Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.

Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Geo. B. Sennett Co., Youngstown, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
W. A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y.

Foundry Equipments—
The S. Obermayer Co., Cincinnati, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Heber Wells, New York City.
Millett Core Oven Co., Brightwood, Mass.
Hanson McDowell, Chicago, Ill.
Cleveland Facing Mill Co., Cleveland, O.
The S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
James Irwin & Co., Pittsburg, Pa.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Columbia Fire Clay Co., Cleveland, O.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Diamond Fire Brick Works, Akron, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Foundry Facings—
The S. Obermayer Co., Cincinnati, O.
Cleveland Facing Mill Co., Cleveland, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.

Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, New York.
Swarts Metal Refining Co., Chicago, Ill.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.

Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizing Pots—
Wm. B. Pollock & Co., Youngstown, O.

Gas Burners—
American Gas Furnace Co., New York City.

Gas Furnaces—
American Gas Furnace Co., New York City.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton O.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conely Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Chicago Die and Machine Works, Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Lime Feeding—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Bickford Drill & Tool Co., Cincinnati, O.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Machinists' Vises—
Massey Vise Co., Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Malleable Iron Castings—
W. A. Wood Mowing & Reaping Machine Co., Hoosick Falls, N. Y.

Manufacturing Chemists—
James Irwin & Co., Pittsburg, Pa.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.
C. H. Besly & Co., Chicago, Ill.

Milling Machines—
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.

Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Mine Pumps—
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Molders' Tools—
The S. Obermayer Co., Cincinnati, O.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
The Hanson & Van Winkle Co., Newark, Chicago, New York.
Northampton Emery Wheel Co., Chicago, Ill.

Nuts and Bolts
Rockford Bolt Works, Rockford, Ill.
Upson Nut Co., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.

Packing—
C. H. Besly & Co., Chicago, Ill
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.

Pattern Letters—
Heber Wells, New York City.

Pattern Makers' Vises—
Massey Vise Co., Chicago, Ill.

Pattern Works—
Gobeille Pattern Co., Cleveland O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.

Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Hickman & Williams, Chicago, Ill.
Shenango Valley Steel Co., New Castle, Pa.
Spearman Iron Co., Sharpsville, Pa.
Salisbury Carbonate Iron Co., New York City.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.

Planers—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.

Planer Chucks—
Massey Vise Co., Chicago, Ill.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbago—
The S. Obermayer Co., Cincinnati, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Pneumatic Tools—
American Pneumatic Tool Co., New York City

Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.

Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
E. Konigslow & Bro. Cleveland, O.

Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.

Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
The Long & Allstatter Co., Hamilton, O.
E. Konigslow & Bro. Cleveland, O.

Pressure Gauges—
The Bristol Co., Waterbury, Conn.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.

Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.

Punches—
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.
E. Konigslow & Bro. Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Uehling, Steinbart & Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.

Rivets—
Champion Rivet Co., Cleveland, O.

Riveted Steel Pipe—
Wm. B. Pollock & Co. Youngstown, O.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Roofs—
Shiffler Bridge Co., Pittsburg.
Berlin Iron Bridge Co., East Berlin, Conn.
Pittsburg Bridge Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Sand—
David Tod Sand Co., Youngstown, O.

Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland, O.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Rockford Bolt Works, Rockford, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.

Shapers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
The Long & Allstatter Co., Hamilton, O.
Ferracute Machine Co., Bridgeton, N. J.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.

Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.

Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
A. H. Nilson Machine Co., Bridgeport, Conn.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.

Stand Pipes—
Wm. B. Pollock & Co., Youngstown, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.

Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner, Fieser & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.

Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Hanson McDowell, Chicago, Ill.

Steel Plants—
Wm. B. Pollock & Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
Shenango Valley Steel Co., New Castle, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.

Semi-Steel—
Hanson McDowell, Chicago, Ill.

Stokers—
Playford Stoker Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock & Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Tank Cars—
Wm. B. Pollock & Co., Youngstown, O.

Tin and Terne Plates—
E. P. Crane & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Tubes—
National Tube Works, McKeesport, Pa.

Tube Welding—
S. Fix Sons, Cleveland, O.

Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Vises—
Massey Vise Co., Chicago, Ill.

Wire Machinery—
John Adt & Son, New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
A. H. Nilson Machine Co., Bridgeport, Conn.

Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.
Shenango Valley Steel Co., New Castle, Pa.

Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

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Enterprise Boiler Co	2
Erikson, Edward E	1
	22
Fitzsimons & Co	—
*Fix Sons	37
Fleharty, J. H. & Co	27
Forster, Waterbury & Co	2
Fox Machine Co	1
Frick Coke Co., H. C	—
	1
Gandy Belting Co	—
Garden City Sand Co	44
Gerlach, Peter & Co	32
Gobeille Pattern Co	29
Goodyear, S. W	37
	27
Hall Steam Pump Co	—
Hanna & Co., M. A	33
*Hanson & Van Winkle Co	26
Harrington & King Perforating Co	—
Harrington Son & Co., Edwin	1
Harrison Safety Boiler Works	23
Hartford Steam Boiler Insp. & Ins. Co	21
Heyl & Patterson	29
†Hickman & Williams	30
Holmes, Strachan & Co	—
Hooven, Owens & Rentschler Co	32
Hunt Robt. W., & Co	26
	2
Illinois Central R. R	—
Ingersoll-Sargent Drill Co	43
Iron Clad Paint Co	2
Irwin and Co., James	40
	32
Jeffrey Mfg. Co	—
Jenkins Bros	31
Jones & Co., John T	40
Jones Foundry & Machine Co., W. A	2
	1
Kentucky Fire Brick Works	—
Konigslow & Bro., E	23
	27
La Belle Steel Co	—
Lake Superior Consolidated Iron Mines	37
Lane & Bodley	28
Lidgerwood Mfg Co	39
Link-Belt Machinery Co	30
Long & Allstatter Co., The	30
Lusch, H. B	23
	2
Main Belting Co	—
Marion Steam Shovel Co	27
Massey Vice Co	44
McDowell, Hanson	2
McKeefrey & Co	23
Meehan Boiler & Construction Co	28
Millers Falls Co	44
Millett Core Oven Co	44
†Modern Machinery	32
Morris & Bailey Steel Co	—
	37
*National Engraving Co	—
National Tube Works Co	43
†Newport Sand Bank Co	—
Nilson, A. H., Machine Co	27
North American Metaline Co	43
Northampton Emery Wheel Co	38
Nuttall Co. The R. D	26
Oak Hill Fire Brick & Coal Co	22
Obermayer, S. & Co	32
Oglebay, Norton & Co	28
†Ohio Sand Co	—
Ohio Steel Co	28
Otis Steel Co	22
*Parkhurst & Wilkinson Co	37
Phœnix Horse Shoe Co	43
Pittsburg Bridge Co	31
Playford Stoker Co	40
Pollock, Wm. B. & Co	3
Prescott Steam Pump Co	38
Q & C Co	21
Rand Drill Co	2
Reading Crane & Hoist Works	30
Riter-Conley Mfg. Co	31
Rockford Bolt Works	2
Rockwell & Co., W. S	I–24
Ryan, J. J. & Co	26
Salisbury Carbonate Iron Co	26
Sanderson Bros. Steel Co	37
Seaman, Sleeth Co	42
Sennett Co., Geo. B	39
Scioto Star Fire Brick Works	32
‖Sharon Fire Brick Works	1
Shenango Valley Steel Co	23
Shiffler Bridge Co	31
Skinner Chuck Co	27
Spearman Iron Co	44
Standard Paint Co	23
Stevens, F B	44—
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Sturtevant Co., B. F	I–35
*Superior Charcoal Iron Co	—
Swarts Metal Refining Co	1
Tabor Mfg Co	32
Textor, O	2
*Tod Sand Co., David	44
Tod, Wm. & Co	39
*Uehling, Steinbart & Co	—
Union Mining Co	22
Union Boiler Tube Cleaner Co	1
United States Hotel Co	33
Upson Nut Co	1
Van Dorn & Dutton Co	26
Vitrified Wheel Co	38
Vulcan Mfg. Co	30
Washington Coal and Coke Co	33
Webster Fire Brick Co	1
Wells, Heber	29
Wellman Seaver Engineering Co	42
White, Byron H	37
Wood Mowing & Reaping Machine Co	41
Wyman & Gordon	43

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MORE WEAR from your tools
.....Almost no **STEEL EXPENSE**
NO TROUBLE

"It pays to use the most reliable tool steel in the market."

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ESTABLISHED 1865 * INCORPORATED 1889.
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CRUCIBLE CAST TOOL STEEL.
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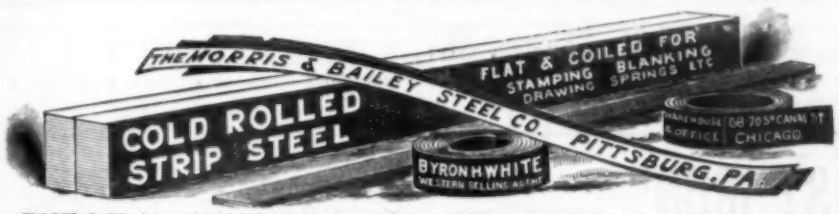
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IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	3.65
No. 1 Specular, Bessemer	3.01@3.25
No. 1 Bessemer hematite	2.75@3.15
Hematites No. 1 non-Bessemer	1.90@2.10
No 1. Specular, non-Bessemer	2.00@2.40
Mesabi Bessemer	1.80@2.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	11 15
No. 1 Strong Foundry	11 00@11 25
No. 2 Strong Foundry	10 50@10 75
Gray Forge, red short	10 50
Gray Forge, neutral	10 25
No. 1 American Scotch	11 15@11 40
No. 2 American Scotch	10 65@10 90
Lake Superior Charcoal	11 50@12 00
PITTSBURG:	
No. 1 Foundry	$11 00@11 30
No. 2 Foundry	10 50@10 60
Gray Forge	9 75@9 85
White and Mottled	9 50
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	22 00@26 00
Bessemer	11 15
CHICAGO:	
Lake Superior Charcoal	$11 50@13 00
Local Coke Foundry No. 1	11 50@12 00
Local Coke Foundry No. 2	11 00@11 50
Local Coke Foundry No. 3	10 75@11 00
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 75@11 00
Southern Coke No. 1	@10 85
Southern Coke No. 2	@10 60
Southern Coke No. 3	@10 10
Southern No. 1 Soft	@10 80
Southern No. 2 Soft	@10 65
Southern Silveries	11 25@11 50
Jackson Co. Silveries	12 50@14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@12 50
Alabama Car Wheel	15 00@16 00
Malleable Bessemer	11 50@12 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$@10 50
Southern Coke No. 2 and No. 1 Soft	@10 25
Hanging Rock Coke, No 1	@11 00
Hanging Rock Charcoal No. 1, Fdy	15 50@16 00
Tennessee Charcoal No 1	14 00@14 25
Jackson County Silvery No 1	12 50@12 75
Southern Coke, Gray Forge	@9 25
" " Mottled	@9 25
Standard Georgia Car Wheel	14 25@15 00
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	11 00@11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 50@11 75
Ohio Strong Softener No. 1	11 50@11 75
Jackson Co. Silvery No. 1	@14 00
Lake Superior Charcoal	12 00@12 50
Southern Soft No. 1	@12 25
" " No. 2	@13 00
ST. LOUIS:	
Southern Coke No 1	$@$10 50
Southern Coke No. 2	@10 25
Southern Coke No. 3	@9 75
Southern Gray Forge	@9 25
Southern Charcoal No. 1	@20 50
Missouri Bessemer	@13 00
Lake Superior Car Wheel	@13 00
Ohio Softeners	@14 00
Southern Car Wheel	@15 00

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[Delivered Cleveland.]	Gross Tons
Old iron rails	$14 00
Old steel rails (6 ft. and over)	9 75
Old steel rails (6 ft. and under)	9 75
Old car wheels	11 00
	Net Tons
No. 1 R. R. wrought scrap	$11 50
Mill scrap	8 50
No. 1 Machine cast scrap	8 25
Iron axles	15 50
Axle turnings	8 00
Wrought turnings (free from cast)	7 00
Cast borings	5 50
Uncut wrought iron boilers	5 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	7 50
Sheet iron	5 25
Wrought drillings	6 50
Malleable iron	8 50

STRUCTURAL MATERIAL.

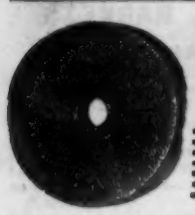
Beams and Channels (f. o. b. Cleveland)	1.40c
Angles	1.30c
Tees	1.40c
Universal Plates	1.40@1.45c
Sheared Plates	1.45c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.05 Base.
2 to 2⅞	.20 extra.
3 to 3⅜	.50 "
3⅝ to 4	.80 "
4¼ to 4½	1.00 "
4¾ to 5	1.30 "
5¼ to 6	1.80 "
6¼ to 6½	2.20 "



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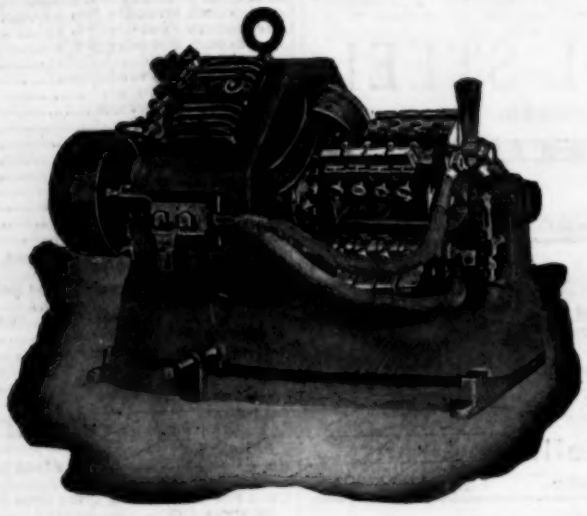

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"METALLURGY OF CAST IRON"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is, "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

6⅝ to 7¼	2.50 extra
¾ to ⅞	.10 "
9-16 to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base
4¼ " 6 x ⅜ to 1	.10 extra
6¼ " 8 x ⅜ to 1	.60 "
8¼ " 10 x ⅜ to 1	.80 "
1⅜ " 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¾ to 15-16 x ⅜ to ⅝	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. Bevel Edge Shaft Iron 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¾ to 4 x No. 9 to 3-16	.40 "
1¾ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅜ to 1⅜	.40 extra.
⅜ to 13-16	.50 "
⅜ to 11-16	.60 "
⅜ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅜	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.	
1¾ to 6,	" 10, 11, 12 or ¼"	.05	per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10	"
1 to 1¾,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or ¼"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-16	" 10, 11, 12 or ¼"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or ¼"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base. Extras.	
7-16 to 2,	" 17, 18, and 19	.05	per 100 lb
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1¼,	" 22	.25	"
¼ to 1¼,	" 13, 14 and 15	.05	"
¼ to 1¼,	" 16, 17 and 18	.10	"

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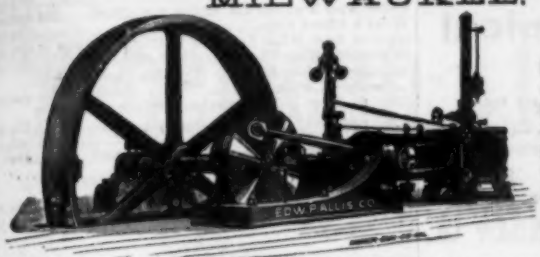
MILWAUKEE, WIS.



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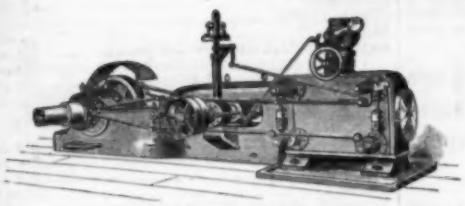

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Simple and Compound.

Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

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And Other Specialties.

We do not claim novelty in these Couplings so much as good material, good workmanship and extreme simplicity. We make them of a very strong cast iron, with wrought iron bands.

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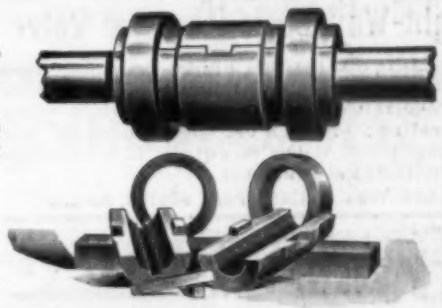
Foundry contracts solicited for duplicate castings, from 10 lbs. to 5 tons each.



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YOUNGSTOWN, OHIO.

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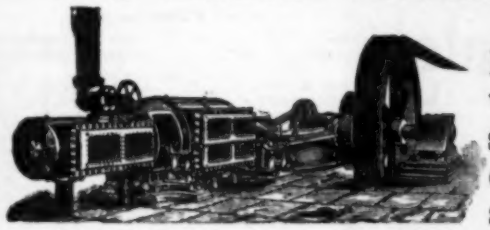

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For Direct Electrical and all High Class Work.

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Who builds the best Mine Pump?

PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.

1⅛ to 1¼,	"	19 and 20	per 100 lbs.
1⅛ to 1¼,	"	21	.20 "
1⅛ to 1¼,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos. 13, 14 and 15		.20 "
⅞,	" 16, 17 and 18		.25 "
⅞,	" 19 and 20		.30 "
⅞,	" 21		.35 "
⅞,	" 22		.45 "
⅞ and 13-16	Nos. 13, 14 and 15		.30 "
⅞ and 13-16	" 16, 17 and 18		.35 "
⅞ and 13-16	" 19 and 20		.40 "
⅞ and 13-16	" 21		.45 "
⅞ and 13-16	" 22		.50 "
⅞ and 13-16	" 23		.60 "
11-16,	Nos. 13, 14 and 15		.35 "
11-16,	" 16, 17 and 18		.40 "
11-16,	" 19 and 20		.50 "
11-16,	" 21		.60 "
11-16,	" 22		.70 "
11-16,	" 23		.80 "
⅝,	Nos. 13, 14 and 15		.40 "
⅝,	" 16, 17 and 18		.45 "
⅝,	" 19 and 20		.55 "
⅝,	" 21		.65 "
⅝,	" 22		.75 "
⅝,	" 23		.85 "
9-16,	" 13, 14 and 15		.45 "
9-16,	" 16, 17 and 18		.50 "
9-16,	" 19 and 20		.60 "
9-16,	" 21		.70 "
9-16,	" 22		.80 "
9-16,	" 23		.90 "
½,	" 13, 14 and 15		.55 "
½,	" 16, 17 and 18		.60 "
½,	" 19 and 20		.70 "
½,	" 21		.80 "
½,	" 22		.90 "
½,	" 23		1.00 "
7-16,	" 13, 14 and 15		.80 "
7-16,	" 16, 17 and 18		.90 "
7-16,	" 19 and 20		1.00 "
⅜,	" 13, 14 and 15		1.00 "
⅜,	" 16, 17 and 18		1.10 "
⅜,	" 19 and 20		1.20 "

Sheet Iron.

No. 10	1 90
No. 12	1 70
No. 14	1 60
No. 15-17	1 [illegible]
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	15c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅛ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
¾ to 6 in.	10½
⅛ to 9-32 and 6⅛ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

⅛, ⅝, 11-16 and ¾ inches diameter	3 60
Bridge ⅛, ⅝, 11-16 and ¾ inch diam.	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent.				.78
Butt "	"	"	"	.73
Lap "	galv.	"	"	.70
Butt "	"	"	"	.67
Boiler tubes 2¼" and smaller				73½
Boiler tubes 2¾" and larger				.75
Casting screw and socket joint				dis. 50
Casing inserted joint				dis. 45

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[From Store, Cleveland.]

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Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b New York or Chicago.

No Name Metal, 15 cts. per lb., f. o. b. New York or Chicago.

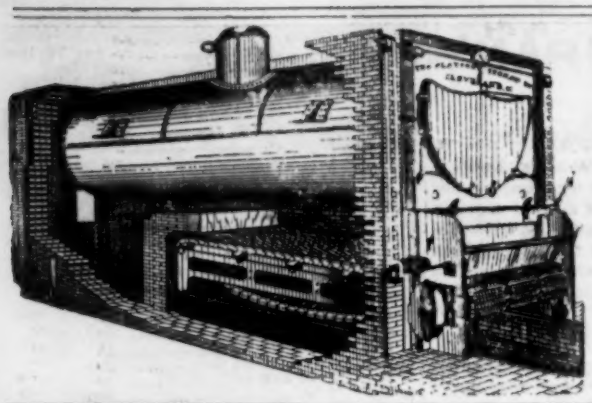
Mystic Metal, 10 cts. per lb., f. o. b. New York o Chicago.

Anvils.

American	9 D 9¾
Wright's	9 D 12

Bellows.

Blacksmiths'	Hill's	dis
	Bullock's	dis 30&10
Moulders'		dis 40&10&10
Hand		dis 40&10&10



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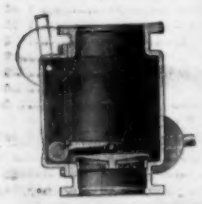
USED BY NEARLY ALL THE RAILROADS.



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FOR TIN OR SHINGLE ROOFS AND IRON WORK. Tin roofs well painted have not required repainting for 10 to 15 years.

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Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

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B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

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Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 50
" 2 Jaw Brass Workers	dis 30
" Drill	dis 30
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1¼"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, F. F
Kegs, ₩ lb	4¾c	5 c	2¾c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 ₩ cans, 10 in case	6 c	6¼c	c
10 lb cans less than 10	10 c	10 c	¼c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8½	6	5⅜	5⅛	
Washers	9	8	7	5	4⅜	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.

Car lots	$1.30
Less than car lots	$1.40

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 5
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&15

Picks.

Railroads, 5 to 6 lbs	dis $12 6
" 6 to 7 lbs	dis $13 60

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MANUFACTURERS OF

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Charcoal Tin Plates,
High Grade Terne Plates,
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Finish,

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(Seymour, Santvoord & Danforth Geer, Receivers.)

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@60
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&15

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2¼ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25

Prentiss.....dis 2
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 5

Wire.

List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75&10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ℔ dis 30

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Cleveland, Lorain & Wheeling
Railroad Company.

Time Table effective May 15th, 1898.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.	North Bound.		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester....	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19
6:52	3:35	8:30	Medina.....	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa L'a	7:04	10:26	5:55
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport	.....	6:05	1:40
.....	8:25	.....	Bellaire.....	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

Trains 1, 2, 5 and 6 daily between Cleveland and Urichsville. All other trains daily except Sundays. Electric cars between Bridgeport and Wheeling, and Bridgeport and Martins Ferry and Bellaire. Consult agents for general information as to the best routes and passenger rates to all points. M. G. CARREL, G. P. A.,
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Marietta, Wheeling & Chicago	†9:25 P M	†7:25 A M
Cleveland Press Special.....	†9:25 P M	†2:00 P M
Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta,...	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore.....	*11:30 A M	†2:00 P M
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Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
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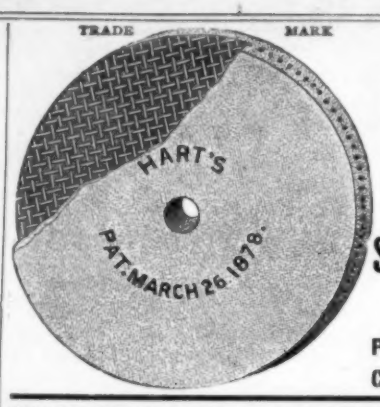

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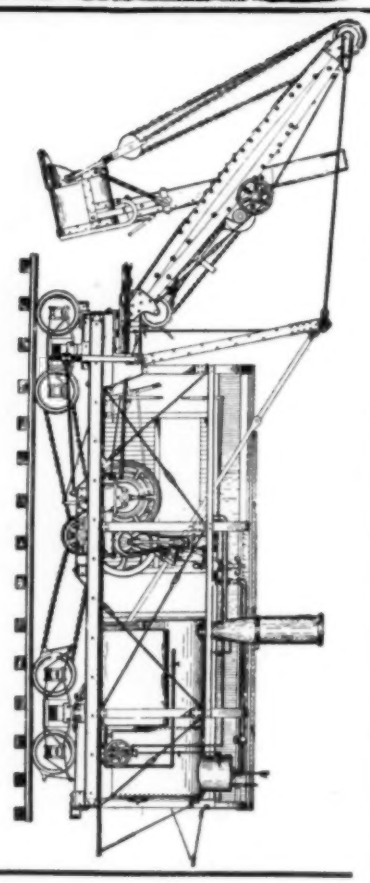

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